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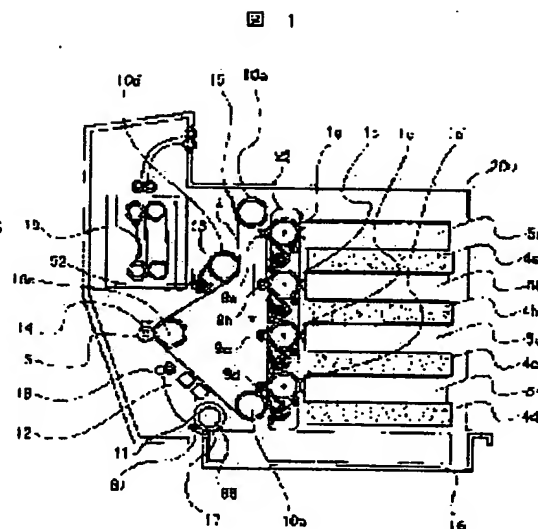
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(54) PHOTORECEPTOR UNIT AND IMAGE FORMING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an image forming device that is small-sized, where high speed printing and high quality recording without any deviation in an image can be carried out and is also superior in its ability for maintenance.

SOLUTION: In the device, a multiple number of photoreceptors are vertically installed on one surface of an intermediate transfer belt that is stretched vertically, a fixing device is installed on the opposite surface and respective photoreceptors are constituted in an integrated unit.



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CLAIMS

[Claim(s)]

- [Claim 1] Two or more photo conductors and two or more photographic filters which form an electrostatic latent image on each of said photo conductor, Two or more developing machines which form a toner image on each of said photo conductor, and the middle imprint object for piling up said toner image and forming a color toner image, It is image formation equipment said two or more photo conductors of whose it has an imprint machine for imprinting said color toner image to a record medium, and the fixing assembly established in said color toner image on said record medium, and are really units.
- [Claim 2] Setting to the image formation equipment of claim 1, a unit is really [said] each image formation equipment of two or more of said photo conductors with which the edge is connected with one base material on the other hand at least.
- [Claim 3] In the image formation equipment of claim 1, said two or more photo conductors are arranged at a single tier, and it is image formation equipment removable in the array direction.
- [Claim 4] Setting to the image formation equipment of claim 3, said two or more photo conductors are withdrawal image formation equipment to the upper part.
- [Claim 5] Setting to the image formation equipment of claim 3, said two or more photo conductors are withdrawal image formation equipment to the slanting upper part.
- [Claim 6] Setting to the image formation equipment of claim 1, said fixing assembly is withdrawal image formation equipment to the upper part.
- [Claim 7] It is image formation equipment with which said photographic filter has the light source of LED in the image formation equipment of claim 1.
- [Claim 8] Two or more photo conductors arranged by the lengthwise direction single tier, and two or more developing machine and two or more photographic filters which have been arranged at the one side of two or more of said photo conductors, It has the middle imprint object arranged at the other side of two or more of said photo conductors, and the form cassette arranged at said two or more photo conductor lower parts. Said two or more developing machines and said two or more photographic filters It is image formation equipment with which it has been perpendicularly arranged to the array direction of two or more of said photo conductors, and said two or more developing machines and said two or more photographic filters have been arranged by turns in the array direction of two or more of said photo conductors.
- [Claim 9] It is image formation equipment which has a case in the image formation equipment of claim 8, and has been arranged by fixing said two or more photographic filters to said case.
- [Claim 10] It is image formation equipment with which each of two or more of said developing machines and each of two or more of said photographic filters have been arranged by turns in order of a photographic filter and a developing machine from said form cassette side in the image formation equipment of claim 8.
- [Claim 11] It is image formation equipment which has at least four rollers which said middle imprint object is a belt configuration in the image formation equipment of claim 8, and lay said belt, and the inside of said roller and at least one contact said belt external surface, and is arranged.
- [Claim 12] Image formation equipment which formed the cleaner which cleans said belt in the roller contacted and arranged on said belt external surface in the image formation equipment of claim 11.
- [Claim 13] Image formation equipment with which the belt mold fixing assembly which stretched the belt in the same direction in general has been arranged with the array direction of two or more of said photo conductors in the image formation equipment of claim 8 at the one side of said middle imprint object.
- [Claim 14] It is image formation equipment with which said belt mold fixing assembly has a heat insulation member in the arrangement side of said middle imprint object in the image formation equipment of claim 13.

[Claim 15] Image formation equipment which has the imprint section arranged at the one side of said middle imprint object, and a fixing assembly in the image formation equipment of claim 8.

[Claim 16] Image formation equipment which has the form heating component which heats a record medium between said imprint sections and said fixing assemblies in the image formation equipment of claim 15.

[Claim 17] It is the photo conductor unit which has two or more photo conductors arranged by the single tier, two or more electrification machines which electrify uniformly each the top of said photo conductor, and two or more photo conductor cleaners which clean each the top of said photo conductor and by which said two or more photo conductors, said two or more electrification machines, and said two or more photo conductor cleaners were constituted from one unit.

[Claim 18] The photo conductor unit which has two or more photographic filters which expose the each front-face top of said photo conductor in the photo conductor unit of claim 17.

[Claim 19] It is the photo conductor unit to which said photographic filter has the LED light source in the photo conductor unit of claim 18.

[Claim 20] Two or more photo conductors supported with one or two base materials, and the supporter holding said base material, Two or more photographic filters which form an electrostatic latent image on each of said photo conductor, and two or more developing machines which form a toner image on each of said photo conductor, Image formation equipment which has the middle imprint object for piling up said toner image and forming a color toner image, the imprint section for imprinting said color toner image to a record medium, and the fixing assembly established in said color toner image on said record medium.

[Claim 21] It is image formation equipment with which said two or more photo conductors which have a case and contain said base material in the image formation equipment of claim 19 are really which can be detached and attached freely units, and said supporter has been arranged at said case side.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to image formation equipments, such as a copying machine which forms the color picture which used electrophotographic technology, a printer, and facsimile.

[0002]

[Description of the Prior Art] By the electrophotography method, a latent image is visualized as a toner image by forming the electrostatic latent image corresponding to image data on a photo conductor, making the potential pattern of an electrostatic latent image correspond, and making the toner which is the electrified particle adhere on a photo conductor, this toner image is imprinted to record media, such as a form, and an image is formed on a form. When forming a color picture in this process, color toners, such as the toner of two or more colors, for example, yellow, a Magenta, and cyanogen, must be piled up, and an image must be formed.

[0003] With the image formation equipment which forms a color picture, the various descriptions are in the approach of piling up the toner of each of this color. The formation approach of a color picture is roughly divided and two kinds are proposed. The repeat development method which one repeats and develops the toner of each color to one photo conductor, and forms a color picture, and another are coincidence development methods which develop the toner of each color to coincidence with two or more photo conductors, and form a color picture. Each color picture formation approach is explained in detail below.

[0004] A repeat development method is a method which forms a color picture using one photo conductor. There are three, a photo conductor overtone pile method, an imprint drum method, and a middle imprint object method, in the example of this method.

[0005] The middle imprint object method which is a method which can record a high-definition image also in it Two or more development counters and middle imprint objects which develop a respectively different color toner around a photo conductor as given in JP,8-137179,A are arranged. After imprinting the toner image formed on the photo conductor on a middle imprint object, repeating this for every color and piling up two or more color toners on a middle imprint object, it is the method which imprints the toner image on a middle imprint object in a form, and outputs a color picture.

[0006] Moreover, JP,10-186894,A and JP,10-260593,A are equipped with two or more photo conductors like a publication, a toner image is formed in coincidence with each photo conductor, a coincidence development method is made to correspond to conveyance of a form, a toner image is imprinted to it, and there is a method represented by the color picture formation approach called the tandem system which forms a color picture.

[0007]

[Problem(s) to be Solved by the Invention] The demand of printing a color picture to record media, such as a form, is increasing with colorization of office environment, and digitization. Four engine performance of the various sexes printable to various record media, such as OHP and pasteboard, besides the high definition to which installation area can output the compactability that it can install in office small, a photograph, etc., and a regular paper corresponding to a form, and the rapidity which prints still a lot of office documents for a short time is required for the color picture formation equipment which fills these demands.

[0008] Two demands called the compactability it whose confidence is a prerequisite for office especially, and the rapidity of printing which comes from improvement in the speed of color picture processing / transmission technique supported by the advance of a personal computer or a network at the list are becoming the important engine performance indispensable to future color picture formation equipment.

[0009] It considers as the configuration which makes this improvement in the speed easy, and there is a

tandem system described previously. With a tandem system, since the toner image of each color is mostly formed in coincidence, a color picture can be formed at a rate equivalent to a monochrome printer. However, since an image is independently formed with each photo conductor, it is very difficult to pile up the toner image of each color. When location ***** of the toner image of each color is influenced by arrangement precision, such as a pitch of each photo conductor and a photographic filter, and parallelism, and these are not arranged with a sufficient precision, the fault reduced greatly generates image grace, like change of the hue by gap of the toner image of each color and an image are visible to a duplex. Furthermore, such arrangement precision will fall greatly also by carrying out desorption of the photo conductor whose user is an article of consumption at the time of exchange. For this reason, in the tandem system, it is the viewpoint of high-definition record and location ***** of each color toner image has been an important technical problem.

[0010] The purpose of this invention is to offer small and a high speed, and the image formation equipment in which high-definition record is possible.

[0011] Moreover, it is in offering image formation equipment excellent in maintenance nature.

[0012]

[Means for Solving the Problem] Two or more photographic filters with which this invention forms an electrostatic latent image on each of two or more photo conductors and said photo conductor, Two or more developing machines which form a toner image on each of said photo conductor, and the middle imprint object for piling up said toner image and forming a color toner image, It has the imprint section for imprinting said color toner image to a record medium, and the fixing assembly established in said color toner image on said record medium, and said two or more photo conductors were really considered as the configuration of a unit.

[0013] Moreover, it has two or more photo conductors arranged by the single tier in the photo conductor unit, two or more electrification machines which electrify uniformly each the top of said photo conductor, and two or more photo conductor cleaners which clean each the top of said photo conductor, and let said two or more photo conductors, said two or more electrification machines, and said two or more photo conductor cleaners be one unit configuration.

[0014] Thus, since it prints using two or more photo conductors, high-speed printing is attained compared with the time of only one using a photo conductor. Moreover, a maintenance becomes easy, while there is no fear of an arrangement gap of each photo conductor by the attachment and detachment at the time of exchange of a photo conductor arising by using two or more photo conductors as an integral unit, there is no image gap at the time of printing and high-definition record is possible.

[0015] Moreover, two or more photo conductors arranged by the lengthwise direction single tier, and two or more developing machine and two or more photographic filters which have been arranged at the one side of two or more of said photo conductors, It has the middle imprint object arranged at the other side of two or more of said photo conductors, and the form cassette arranged at said two or more photo conductor lower parts. Said two or more developing machines and said two or more photographic filters It has been perpendicularly arranged to the array direction of two or more of said photo conductors, and said two or more developing machines and said two or more photographic filters were considered as the configuration arranged by turns in the array direction of two or more of said photo conductors.

[0016] By considering as such an arrangement configuration, even when using two or more photo conductors, high-speed printing is possible and small image formation equipment can be offered.

[0017] By making it fix to the case side of image formation equipment, and furthermore, arranging a photographic filter, there is no gap of design-exposure, stable exposure is possible and the image formation equipment in which high definition image recording is possible can be offered.

[0018]

[Embodiment of the Invention] It explains using a drawing below.

[0019] (Example 1) Drawing 1 shows the outline cross section of the image formation equipment which is the 1st example of this invention, and can provide small and high-speed printing, and coincidence with the image formation equipment in which high definition image recording is possible.

[0020] Yellow required for color picture formation, a Magenta, cyanogen, and four photo conductors 1a, 1b, 1c, and 1d corresponding to the toner of four colors of black have been arranged side by side perpendicularly, and each made each shaft pivotable, connected it with the center section of the case 200 with the base material, and has prepared it in it as photo conductor unit 22 configuration of one. Furthermore, tension arranges the middle imprint belt 2 for a long time perpendicularly almost horizontally in four belt firm-bridging rollers 10a, 10b, and 10c and the array direction of the photo conductor of

plurality 10d so that two or more photo conductors 1a, 1b, 1c, and 1d which arranged perpendicularly and have been arranged may be contacted. The imprint auxiliary rollers 9a, 9b, 9c, and 9d for imprinting the toner image from a photo conductor on a belt were then formed in the location which countered each photo conductors 1a, 1b, 1c, and 1d through the middle imprint belt 2. And it sets to each photo conductors 1a, 1b, 1c, and 1d which arranged perpendicularly and have been arranged. With the side by which the middle imprint belt 2 has been arranged, the laminating of the photographic filters 4a, 4b, 4c, and 4d which expose an each photo conductors [1a, 1b, 1c, and 1d] front face to the opposite side, and form an electrostatic latent image in it, and the developing machines 5a, 5b, 5c, and 5d which visualize the electrostatic latent image with a toner was carried out by turns to the lengthwise direction, and they are arranged to it. In addition, although there may be some clearances between each photographic filters 4a, 4b, 4c, and 4d and each developing machines 5a, 5b, 5c, and 5d and some members of other may intervene, also in order to miniaturize equipment, it considers as small spacing as much as possible in the meantime.

[0021] Moreover, each photo conductors 1a, 1b, 1c, and 1d are rotating in the counterclockwise direction in drawing 1 . In the location in contact with the so-called middle imprint belt 2, it is rotating from the upper part to the lower part. Thus, if a photo conductor rotates, arrangement of other **** processes and the hand of cut of the middle imprint belt 2 will be determined. In this case, the middle imprint belt 2 rotates from the upper part to a lower part like a photo conductor in the location in contact with a photo conductor.

[0022] Moreover, the middle imprint belt cleaner 15 which cleans the toner on the image sensor 11 which detects the variation rate of each color image, the toner electrification machine 12 which prepares the electrification nature of a toner, the imprint machine 13 which imprints the toner image on the middle imprint belt 2 in the form of a record medium, the form electric discharge machine 14 which exfoliates a form from the middle imprint belt 2, and the middle imprint belt 2 is formed in the periphery of the middle imprint belt 2. The belt ** toner stripping section 52 which collects the ** toners cleaned with this middle imprint belt cleaner 15 is formed. Furthermore, on the conveyance path of a form, the form cassette 16, the feed device 17, the separation putt 87, the resist roller 18, and the fixing assembly 19 are arranged.

[0023] Next, the enlarged drawing of the configuration of the periphery of a photo conductor is shown in drawing 3 . Although the circumference of photo conductor 1a is explained below, other photo conductors 1b, 1c, and 1d are the same.

[0024] Electrification machine 3a charged in photo conductor 1a around each photo conductor 1a, Erasion lamp 8a which discharges photographic filter 4a explained previously, developing-machine 5a, the middle imprint belt 2, and a photo conductor 1a front face, photo conductor cleaner 6a which cleans a residual toner, ** toner stripping section 7a which collects the ** toners cleaned by photo conductor cleaner 6a, In the middle imprint belt 2, imprint auxiliary roller 9a which assists imprinting the toner image formed on photo conductor 1a of developing-machine 5a on the middle imprint belt 2 is prepared.

[0025] In this example, in order to remove the toner which remained on photo conductor 1a, and the toner to which the toner image on the middle imprint belt 2 carried out reverse transcription, and adhered after imprinting a toner to the middle imprint belt 2, the photo conductor cleaners 6a, 6b, 6c, and 6d are formed.

[0026] Since the color mixture of the unevenness of light exposure or the toner of developing-machine 5a will occur if the toner remains to photo conductor 1a, it is required to remove these toners certainly. Therefore, a cleaning blade may be used for the photo conductor cleaners 6a, 6b, 6c, and 6d, and a photo conductor may be cleaned. Since a cleaning blade contacts directly the elastic blade formed with rubber etc. to a photo conductor and scratches a toner, it can ensure cleaning. Furthermore, since it is the easy configuration of only a blade, cost reduction is possible while being able to make a cleaner configuration small.

[0027] The toner which it failed to scratch with the photo conductor cleaners 6a, 6b, 6c, and 6d is discharged using gravity to photo conductors 1a, 1b, and 1c and the ** toner stripping sections 7a, 7b, 7c, and 7d arranged caudad 1d. The ** toner stripping sections 7a, 7b, 7c, and 7d are conveying the toner by rotating this using the roller of a spiral configuration. the ** toner discharge path 102 (refer to drawing 2) in which the toner collected by the ** toner stripping sections 7a, 7b, 7c, and 7d is finally arranged in equipment -- passing -- a ** toner case etc. -- conveying -- bundling up -- **** -- it is made like.

[0028] Moreover, it is effective to attenuate the potential on the front face of a photo conductor beforehand, before being charged in order to stabilize the potential of photo conductors 1a, 1b, and 1c and 1d front face. Moreover, if the potential of an induction body surface is lowered, electrostatic connection of a photo conductor and a toner becomes weaker, and cleaning of the toner which remained on the photo conductor can be ensured. The erasion lamps 8a, 8b, 8c, and 8d which furthermore discharge photo conductors 1a, 1b, 1c, and 1d, respectively are formed. The erasion lamps 8a, 8b, 8c, and 8d are LED arrays, and discharge a

photo conductor front face by optical exposure.

[0029] Next, the physical relationship of each photo conductors 1a and 1b and the location of an image are explained using drawing 4. When drawing 4 (a) has photo conductors 1a and 1b in the location of normal, in when photo conductor 1b shifts and drawing 4 (b) has been arranged, drawing 4 (c) shows the case where the images 20 and 21 formed with photo conductors 1a and 1b are piled up.

[0030] It is required that the image formation equipment of this invention should output the high resolution of a photograph etc. and a high-definition image. although it is required to make a minute dot print correctly, to raise the homogeneity of a poor image, etc. in order to realize high-definition record, a gap of the toner image of each color is that of an image -- in order to cause a gap of **** and a hue and to reduce image grace greatly, it is required to perform alignment of the image of each color correctly.

[0031] The arrangement location of each photo conductor and the arrangement location of a photographic filter are important for the alignment of each color toner image.

[0032] First, exposure is started in photographic filter 4a on 1st photo conductor 1a located in the middle imprint belt 2 hand-of-cut maximum upstream section. The image exposure by 2nd photo conductor 1b which is directly under photo conductor 1a. In order to pile up the image 20 formed by photo conductor 1a on the middle imprint belt 2, and the image 21 formed by photo conductor 1b, From the start time of image exposure of photographic filter 4b to photo conductor 1a, it carries out by delaying only the time amount which an electrostatic latent image moves to the contact section with the middle imprint belt 2 from an exposure location, and the time amount to which middle imprint belt 2 front face passes through between photo conductor 1a and 1b. Therefore, in the image alignment of each color, a photo conductor and a middle imprint hair side of belt side rate are important for the distance to the contact location from the exposure location on each photo conductor to the middle imprint belt 2, spacing between [1a and 1b] each photo conductor, and a list. If photo conductor 1b shifts and is arranged from the position like drawing 4 (b) at this time, an image 20 and 21 tips will shift corresponding to that gap. For this reason, precision with a high arrangement location precision of each photo conductor and a photographic filter is required.

[0033] However, since surface wear and degradation of a sensitization property take place with printing, a photo conductor needs to be exchanged. Furthermore, with the image formation equipment used in a business environment, it is required that articles of consumption should be exchanged for user itself. It is easily difficult for the present condition for an exchangeable configuration to become such a factor that reduces the arrangement precision of a photo conductor conversely, and to arrange precision highly.

[0034] When considering as the configuration which makes each photo conductor a separate unit and exchanges it separately, each photo conductor's being a scattering unit and they keep an arrangement precision of each photo conductor important at the alignment of each color image by being exchanged separately as it is low and ****.

[0035] So, in the example of drawing 1, two or more photo conductors 1a, 1b, 1c, and 1d with which the toner image of each color is formed have been placed in a fixed position in a unit called the photo conductor unit 22, and it considered as the configuration which exchanges the photo conductor unit 22 whole.

[0036] In this example, the photo conductor unit 22 is really constituted and formed by making each photo conductors 1a, 1b, 1c, and 1d, the electrification machines 3a, 3b, 3c, and 3d, the photo conductor cleaners 6a, 6b, 6c, and 6d, and the ** toner stripping sections 7a, 7b, 7c, and 7d into a unit. In addition, the erasion lamps 8a, 8b, 8c, and 8d may be arranged in the photo conductor unit 22, and may be formed outside.

[0037] Moreover, if photo conductor unit 22 itself shifts from a convention location and it is arranged like drawing 4 (c), like drawing 4 (a) to drawing 4 (c), a photo conductor will shift and will be arranged.

However, since unitization of the photo conductor is carried out, the amount of gaps of photo conductors 1a and 1b is equal. For this reason, although the images 20 and 21 formed with photo conductors 1a and 1b shift from a regular location and it imprints on the middle imprint belt 2, the amount of gaps of images 20 and 21 is the same, and, finally an image laps correctly. At this time, the gap of the tip location of an image which piled up each color is small enough, and does not become a problem from the doubling precision with which an image tip and a form tip are doubled at the time of feeding of a record medium, and an imprint actually. Thus, each photo conductors 1a, 1b, 1c, and 1d are placed in a fixed position in a unit called the photo conductor unit 22, by considering the photo conductor unit 22 as an exchangeable configuration, alignment of each color image can be performed correctly and the image formation equipment in which high-definition record is possible can be realized.

[0038] Moreover, about the alignment of the toner of each color image, photographic filters [which expose each photo conductors 1a, 1b, 1c, and 1d / 4a 4b, 4c, and 4d] arrangement precision is also important. For example, when the photographic filter which exposes each photo conductor is attached in the member in

which closing motion like up covering of a body is possible, possibility that the arrangement location of each photographic filter will shift at the time of closing motion of these members is high, and it is easy to generate an image location gap.

[0039] Therefore, with the image formation equipment of this example, an each photographic filters [4a 4b, 4c, and 4d] arrangement location's being exact and fluctuation can be lost by placing in a fixed position each photographic filters 4a, 4b, 4c, and 4d to the body case 200.

[0040] However, since it is very highly precise and alignment of each color image must be performed when making resolution high corresponding to higher definition image recording, this configuration may also be inadequate.

[0041] As such a case, in order to perform alignment of each color image correctly, when articles of consumption are exchanged, when a gap of each color image is large, by a certain fault, a sample pattern is printed, the device in which a user or an operator can adjust the beginning location of an image based on this is established, and high-definition record is always enabled at this example.

[0042] Furthermore, as an approach of performing alignment of each color image correctly, the above is developed more, the location of each color image is detected, and the device which controls the timing and the location of the beginning according to the amount of gaps of an image can also be applied. This image location gap control section is constituted by the gap calculation section which judges how many actually printed images shift based on the detection result of the image sensor 11 and the image sensor 11 which detects the location of each image (for example, Hierro, a Magenta, cyanogen, 4 color images of black), and the image amendment section which performs image amendment to each image based on the result of the gap calculation section. The location of an image can be correctly measured by printing beforehand a pattern with easy measurement of an image gap of each color, for example, an image location detection pattern, on the middle imprint belt 2, and measuring the time amount by which the image was detected. This image location detection pattern prints equipment to the non-image fields between forms etc. to the decided timing which exists under printing etc. at the time of starting.

[0043] Here, one example of the image sensor 11 is explained. The image sensor 11 is arranged on the middle imprint belt 2, and detects the location of each color image on the middle imprint belt 2. In the image sensor 11, a light-emitting part and a light sensing portion are prepared, the light emitted from the light-emitting part is applied to middle imprint belt 2 front face, and the reflected light is considered as the configuration which receives light by the light sensing portion. Since the luminous intensities reflected by the case where there is nothing with the case where there is a toner, on the middle imprint belt 2 differ, this difference is detected and the existence of a toner is detected. In order to make location detection precision of a toner image high at this time, it is required to make smaller than the allowed value of an image location gap the diameter of a spot of the light which comes out of a light-emitting part. In this example, since the location gap of the image of each color is set to 100 micrometers or less, the diameter of a spot of the light taken out from a light-emitting part is set to 100 micrometers or less. A laser diode, LED, etc. can be used for a light-emitting part. As an image sensor, although the above-mentioned light was used, otherwise, it is possible to use the electrometer which measures the potential of the toner which is the electrified particle.

[0044] Moreover, a gap of each color toner image has a gap of the parallel direction of four directions of each color image, an include-angle gap of an image, and expansion and contraction of the four directions of an image. At this example, a total of two image sensors 11 which detect an image location gap have been arranged like drawing 20 right-hand side and on the left-hand side of the middle imprint belt 2, and the detailed location of an image is measured by measuring by two or more image sensors 11. As a result of the image sensor's 11 detecting, when each image is shifted from the prospective location, it is because the gap has arisen in the location of the beginning timing of exposure, or each process. Based on this result, it judges how each image is shifted in the gap calculation section, or how much it is shifted. In the gap calculation section, an include-angle gap and expansion and contraction of an image are judged in the location list of each image from location measurement results, such as not only the tip location of each image pattern but a back end location, its right and left, etc. For example, if each Rhine of a character pattern like a wedge mold is measured, it is possible to get to know the location at a tip, an include-angle gap, etc.

[0045] Based on this result, the image amendment section adjusts x of the beginning location of the actually printed image, a y-coordinate, the include angle of an image, and the die length of an image. When rotating each color image or making it extend and ** in the image amendment section, the whole image to print is stored on memory and the approach of performing an image processing can be applied.

[0046] Since the image sensor 11 is arranged in the field and opposite location where the toner of the middle imprint belt 2 has adhered, it may become dirty with the scattering toner from the middle imprint belt 2, and

this becomes the factor which reduces detection precision. Since this is prevented, it is also possible to establish the device which cleans the image sensor 11. Moreover, when not measuring an image location, the configuration over which covering which covers luminescence and the light sensing portion of the image sensor 11 is covered is also effective in dirt prevention of a sensor.

[0047] Moreover, since level changes corresponding to the coating weight of a toner, the light which the light sensing portion of a sensor detects can detect the coating weight of the toner on the middle imprint belt 2. Then, when establishing the controlling mechanism which controls exposure reinforcement, the exposure time, development bias, etc. corresponding to toner coating weight which was described previously and aiming at improvement in image quality, the image sensor 11 of other examples can also be used as a sensor which measures toner coating weight.

[0048] Next, the detail of the one above-mentioned example of the photo conductor unit 22 is shown in drawing 2. The side elevation of a photo conductor unit is shown in drawing 2 (a) and drawing 2 (b), and the top view of a photo conductor unit, drawing 2 (d), and drawing 2 (a) show the side elevation of the opposite side to drawing 2 (c).

[0049] As the photo conductor unit 22 shown in drawing 2 (b) mentioned above Two or more photo conductors 1a, 1b, 1c, and 1d, Each of those photo conductors 1a, 1b, and 1c and the photo conductor cleaners 6a, 6b, 6c, and 6d which clean 1d top, The ** toner stripping sections 7a, 7b, 7c, and 7d which collect the ** toners cleaned with each photo conductor cleaners 6a, 6b, 6c, and 6d, and each photo conductors 1a, 1b, and 1c and the electrification machines 3a, 3b, 3c, and 3d uniformly charged in 1d top are formed.

[0050] Like drawing 2 (c), at least, the photo conductor unit 22 has arranged each photo conductors 1a, 1b, 1c, and 1d so that it may support with two base materials 110a and 110b, and it has prepared the supporter holding these base materials 110a and 110b in the case 200 side. Each so-called photo conductors 1a, 1b, 1c, and 1d are constituted as a unit of one. Moreover, while being able to arrange each photo conductors [1a 1b, 1c, and 1d] spacing and parallelism with high precision by performing precision adjustment at the time of manufacture, it is possible to maintain the precision. Furthermore, since it exchanges as a photo conductor unit 22 which each photo conductors 1a, 1b, 1c, and 1d really consist of even when a user exchanges photo conductors, spacing and parallelism between each photo conductor are also made to stability. Moreover, with this configuration, although each photo conductors 1a, 1b, 1c, and 1d may displace the arrangement location of the photo conductor unit 22 from a convention location as a photo conductor unit 22 since desorption is carried out, exchange and, each photo conductors 1a, 1b, 1c, and 1d in the photo conductor unit 22 become easy [the alignment of an image], without the arrangement location of a photo conductor shifting, since it is parallel while maintaining regular spacing. The distance of the four directions between each so-called photo conductor does not shift, photo conductors can be exchanged easily, and maintenance nature improves.

[0051] Moreover, by really considering as a unit together with two or more photo conductors, peripheral devices, such as the electrification machines 3a, 3b, 3c, and 3d related to two or more photo conductors 1a, 1b, 1c, and 1d, do not drop maintenance nature, either, but the high definition stabilized further and the high definition image recording of them become possible.

[0052] Next, the two or more photo conductors [1a 1b, 1c, and 1d] drive approach is explained (refer to drawing 2 (c) and (d)). The drive of a photo conductor can apply the approach of making each photo conductors 1a, 1b, 1c, and 1d this rotational speed, and the approach of making it into a different rotational speed. When dispersion in an each photo conductors [1a, 1b, 1c, and 1d] diameter can be made small, the approach of driving each photo conductor with the same rotational speed is used.

[0053] Each photo conductors 1a, 1b, 1c, and 1d form the photo conductor drive gear 100 which carries out the rotation drive of each shaft, in order to connect with base materials 110a and 110b, and they drive these photo conductors 1a, 1b, 1c, and 1d by one gear from a body side (a photo conductor unit outside side, case 200 side). It and the ** toner stripping section drive gear 101 which drives the ** toner stripping sections 7a, 7b, 7c, and 7d to coincidence are formed. Furthermore, with the side by which the photo conductor drive gear 100 is arranged, the ** toner discharge path 102 which discharges a ** toner is formed in the so-called opposite side and base material 110a side.

[0054] Moreover, it is also possible to arrange the connection of a gear which drives each photo conductors 1a, 1b, 1c, and 1d to a body side, and to drive each photo conductors 1a, 1b, 1c, and 1d by four gears from a body side. In this case, supposing the photo conductor unit 22 being detached and attached up, it shifts little by little, and the photo conductor drive gear 100 which drives each photo conductors 1a, 1b, 1c, and 1d is in a completely different class, and is arranged so that a body gear and the photo conductor drive gear 100 may

not interfere at the time of attachment and detachment of the photo conductor unit 22.

[0055] Moreover, even if connection of each photo conductors 1a, 1b, 1c, and 1d does not use the above gears, it can also be connected by the belt.

[0056] When two or more photo conductors [1a, 1b, 1c and 1d] diameter dispersion is large, if each photo conductors 1a, 1b, 1c, and 1d are driven at this rotational frequency, a peripheral-speed difference will arise between each photo conductor, and a location gap and slipping of an image will occur. These peripheral-speed differences can be reduced by each photo conductors 1a, 1b, and 1c and the method of driving 1d independently. By forming the motor driven, respectively to each photo conductors 1a, 1b, 1c, and 1d, and amending an each photo conductors [resulting from dispersion in a photo conductors / 1a, 1b, 1c, and 1d / diameter etc. / 1a, 1b, 1c, and 1d] peripheral-speed difference, it becomes possible to come together and to raise the alignment precision of an image, and is effective in high-definition-izing. Moreover, in order to make the middle imprint belt 2 not bend in each photo conductors 1a, 1b, and 1c and 1d at this time, 1d of photo conductors of the migration direction lower stream of a river of the middle imprint belt 2 may be driven earlier than upstream photo conductor 1a.

[0057] Especially when a developing machines 5a, 5b, 5c, and 5d and photo conductor cleaners [6a, 6b, 6c, and 6d] friction load can be made small, it is not necessary to give driving force to photo conductors 1a, 1b, 1c, and 1d, and it is also possible to the middle imprint belt 2 to carry out a follower drive. In this case, since each photo conductor [1a 1b, 1c, and 1d] peripheral speed can be made to agree at the rate of the middle imprint belt 2, alignment of each color toner can be performed easily. At this time, it is also possible to prepare high friction material, such as rubber, in the non-printing area of the member 2 which raises coefficient of friction for the driving force of the middle imprint belt 2 to middle imprint belt 2 front face in order to transmit to 1d certainly, photo conductors 1a, 1b, and 1c and, for example, a middle imprint belt, and a photo conductor 1.

[0058] As stated also in advance, the middle imprint belt 2 is driving belt firm-bridging roller 10b arranged in the location which pulls a photo conductor, i.e., the lower part of 1d of photo conductors, in order not to make the belt side in contact with photo conductors 1a, 1b, 1c, and 1d generate a deflection. This belt firm-bridging roller 10b provides friction strata, such as rubber, in the roller front face so that a belt and a roller may not be slippery. Furthermore, generating of the deflection of the belt described previously can be pressed down by changing photo conductors [1a 1b, 1c, and 1d] peripheral speed and the rate of the middle imprint belt 2 a little, and carrying out the rate of the middle imprint belt 2 early. The drive approach of the middle imprint belt 2 can also use the following configurations by the approach of giving a tension to a belt. The deflection of the photo conductor array side of the middle imprint belt 2 can also be decreased by giving a tension to a belt in respect of the photo conductor side of the middle imprint belt 2 with which the imprint machine 13 (refer to drawing 1) and the middle imprint belt cleaner 15 contact at the member used as the rotation load of the middle imprint belt 2, and this example. For this reason, the drive of a belt may be driven with the belt firm-bridging rollers 10a, 10c, and 10d by giving the tension of the middle imprint belt 2 using belt firm-bridging roller 10a, 10b, or another member in which it was prepared at the photo conductor side. For example, even when giving a tension to a belt and driving belt firm-bridging roller 10a by belt firm-bridging roller 10b, since the belt side where each photo conductor is arranged is always stretched, a deflection does not generate it.

[0059] Furthermore, if the contact load of the middle imprint belt cleaner 15 can be reduced, it is also possible to consider the middle imprint belt 2 as the follower drive of a photo conductor. If the photo conductors 1a, 1b, 1c, and 1d previously described also in this case are made to follow to the middle imprint belt 2, since both surface velocity agrees, the alignment of each color image is easy similarly.

[0060] When carrying out adjustable [of the rotational speed of the above-mentioned photo conductors 1a, 1b, 1c, and 1d or the middle imprint belt 2], those drives use the motor in which revolving speed control, such as a pulse motor and a servo motor, is possible.

[0061] Next, the drive approach of each main other processes is explained.

[0062] Although the electrification roller which used as the electrification machines 3a, 3b, 3c, and 3d, and was shown in drawing 1 and drawing 2 is used, the drive of an electrification roller consists of this examples in photo conductors 1a, 1b, 1c, and 1d so that a follower drive may be carried out, in order to simplify the configuration of the circumference of a photo conductor. However, when the thing of a major diameter was used for the electrification roller in order to prolong a life, or when it cannot form the surface layer of high lubricity in an electrification roller front face for the purpose which presses down adhesion of a toner and a photo conductor and sufficient frictional force cannot be acquired, it is good also as a configuration which gives and drives power from a drive besides a photo conductor.

[0063] Moreover, since each is constituted as a removable unit as development counters 5a, 5b, 5c, and 5d are shown in drawing 5, power is separately transmitted to each development counters 5a, 5b, 5c, and 5d. In this example, the power of a development counter drive motor is branched to four by the body side, and each development counter is driven. Moreover, it is also possible to drive each development counter with each photo conductor.

[0064] Moreover, since the coating weight of a toner is controllable with the image formation equipment using a nonmagnetic 1 component development method changing the rotational speed of a developing roller 37 as shown in drawing 11, it is the purpose which adjusts the coating weight of each color, and it is also possible to drive each development counters 5a, 5b, 5c, and 5d by another motor, and to give a difference to a development counters [of each color / 5a 5b, 5c, and 5d] rotational frequency.

[0065] The imprint roller is used for the imprint machine 13 in the example of drawing 1. This imprint roller is making the middle imprint belt 2 follow in order to facilitate a device. Driving is also possible when an imprint roller gives a big rotation load to the middle imprint belt 2.

[0066] Next, one example of the printing sequence of the image formation equipment of this example is explained using drawing 1 and drawing 3.

[0067] If a print instruction is first sent to a controller (un-illustrating), the drive of the middle imprint belt 2, the drive of photo conductors 1a, 1b, 1c, and 1d, and electrification will be started. Then, while image exposure of the photo conductor 1a in contact with the middle imprint belt 2 is carried out by photographic filter 4a, and forming an electrostatic latent image on photo conductor 1a, developing an electrostatic latent image by development counter 5a and forming a toner image on photo conductor 1a, a toner image is imprinted to up to the middle imprint belt 2. Mostly, photo conductor 1b in directly under also performs image exposure, and forms a toner image in coincidence in developing-machine 5b. Exposure initiation of this photo conductor 1b is adjusting timing so that the toner image formed in photo conductor 1b may lap with the image previously formed by photo conductor 1a correctly on the middle imprint belt 2. The image on which the toner image of two colors was put is formed on the middle imprint belt 2 in this process. The full color image on which similarly the photo conductors 1c and 1d of three amorous glance and four amorous glance performed exposure, development, and an imprint, and each color toner image was put on the middle imprint belt 2 is formed. With the imprint vessel 13, paper is fed to the full color image on the middle imprint belt 2 from the form cassette 16, it is imprinted to record media, such as a conveyed form, and is established by the fixing assembly 19, and paper is delivered to it from the case 200 upper part. In addition, ***** [the number of **** processes, such as a photo conductor and a developing machine, / a full color image can be recorded also with the toner of three colors of yellow, a Magenta, and cyanogen, and / three] although the toner of four colors is used and the full color image is recorded in this example, in order to record a high definition full color image.

[0068] Although the color picture formation equipment using an electrophotography method piles up the toner of a different color and forms a color picture, with the image formation equipment of this example, the coincidence printing method which forms an image in coincidence mostly is used for it using four photo conductors corresponding to the toner to be used, yellow, a Magenta, cyanogen, and black.

[0069] Furthermore, the arrangement relation which includes the photo conductor and middle imprint object of image formation equipment of a publication in drawing 1 is explained below. [of this example] A belt-like middle imprint object is shown especially below.

[0070] The image formation equipment of this example does not need to arrange the photo conductor unit 22 and a fixing assembly 19 on the same straight line, in order to imprint collectively in the form which is the last record medium, after piling up each photo conductors 1a, 1b, and 1c and each color toner image formed on 1d on a belt-like middle imprint object. With the image formation equipment of drawing 1, the middle imprint belt 2 is arranged between the photo conductor unit 22 and a fixing assembly 19. By this, a long and slender equipment configuration can be improved in the photo conductor array direction, and space-saving-ization can be attained.

[0071] Furthermore, the whole equipment can be miniaturized by laying so that the cross section of the whole belt of the middle imprint belt 2 may be made small. Moreover, laminating arrangement of the photographic filters 4a, 4b, 4c, and 4d which expose and develop each photo conductor 1, respectively, and the development counters 5a, 5b, 5c, and 5d is carried out in the lengthwise direction. For this reason, if these members become large, the magnitude of equipment, especially height will become large. At this example, the whole equipment is miniaturized by making photographic filters 4a, 4b, 4c, and 4d and development counters [5a, 5b, 5c, and 5d] height lay length smaller than horizontal die length.

[0072] Furthermore, by this example, while arranging mostly photo conductors 1a, 1b, 1c, and 1d on a

lengthwise direction straight line, it is made the configuration which stretches the middle imprint belt 2 for a long time in general horizontally in the photo conductors [1a 1b, 1c, and 1d] array direction. In case the toner image formed with each photo conductors 1a, 1b, 1c, and 1d by making the field by the side of the photo conductor of the middle imprint belt 2 into a flat surface is piled up, while transit of an important belt can be carried out to stability While lowering components cost by, and communalizing, adjustment of **** conditions can carry out simple. [each photo conductors 1a, 1b, and 1c and the process components of the circumference of 1d] [isomorphism] [**]

[0073] In this example, the photo conductor unit 22 equipped with each photo conductors 1a, 1b, 1c, and 1d was arranged perpendicularly, and the photo conductor unit 22, the middle imprint belt 2, and the fixing assembly 19 are arranged side by side in the longitudinal direction (direction perpendicular to the gravity direction) as mentioned above. By considering as the above-mentioned arrangement configuration, the imprint machine 13 and a fixing assembly 19 are arranged in the location near equipment external surface, and the conveyance path of a form can be arranged along the external surface of a body. For this reason, even when a paper jam is generated and a form remains in a body, the tooth back (imprint machine arrangement side) of a case 200 can be opened, and a form can be removed easily. For example, when passing between each photo conductor and imprint belts and conveying a record medium, after removal of the record medium which remained inside equipment at the time of paper jam generating removes each photo conductor and an imprint belt, it will be necessary to perform it, and a very complicated procedure will be needed.

[0074] Next, one example of the exchange approach of each process containing the photo conductor unit 22 and developing machines 5a, 5b, 5c, and 5d of image formation equipment of this example and the open structure of each part of a case is explained using drawing 5.

[0075] As mentioned above, since wear, degradation, etc. of a front face take place with printing, a photo conductor needs to be exchanged. Furthermore, it is necessary to also exchange developing machines with consumption of a toner. In order to realize outstanding maintenance nature, it is important that articles of consumption, such as these photo conductors, developing machines, etc., can exchange easily.

[0076] In this example, the photo conductor unit 22 with which photo conductors 1a, 1b, 1c, and 1d were united is considered as the configuration removable in the photo conductors [1a, 1b, 1c, and 1d] array direction, i.e., a lengthwise direction. Although the photo conductor unit 22 long to a lengthwise direction is arranged in the example of drawing 1 between the photographic filters 4a, 4b, 4c, and 4d fixed to a body case, and the middle imprint belt 2, exchange is easy by considering as the above-mentioned configuration.

[0077] Furthermore, with the image formation equipment of this example, it is considering as the developing machines 5a, 5b, and 5c of each color, and the configuration which are made to slide perpendicularly to a longitudinal direction, i.e., the orientation of the photo conductor unit 22, and are detached and attached while arranging 5d of each along with the photo conductor unit 22 perpendicularly to the orientation (the direction of slant to which it inclined for a while from the lengthwise direction or the lengthwise direction) of the photo conductor unit 22. In this example, developing machines 5a, 5b, 5c, and 5d have been arranged, respectively among each photographic filters 4a, 4b, 4c, and 4d fixed to the body case 200, and it arranges along with the photo conductor unit 22 by turns. By considering as such a configuration, its burden of the exchange person who exchanges articles of consumption decreases while exchange becomes easy. Moreover, since the electrification machines 3a, 3b, 3c, and 3d and the photo conductor cleaners 6a, 6b, 6c, and 6d become dirty by adhesion of the toner accompanying printing etc., they suppose that it is exchangeable. With the image formation equipment of this example, it arranges in the photo conductor unit 22, and is exchanged for the photo conductor unit 22 and coincidence as drawing 2 shows. At this time, desorption may constitute the electrification machines 3a, 3b, 3c, and 3d, the photo conductor cleaners 6a, 6b, and 6c, and 6d itself from a photo conductor unit 22 as a unit so that easily.

[0078] Since photo conductors 1a, 1b, 1c, and 1d are placed in a fixed position in the photo conductor unit 22, each photo conductor is exchanged in all at the time of exchange of the photo conductor unit 22. However, when it considers as the configuration which prints only using the photo conductor of a toner required for printing using the device to which disjunction of each photo conductors 1a, 1b, 1c, and 1d which were described previously, and the middle imprint belt 2 is carried out, extent of wear or degradation differs for every photo conductor. Since exchange of the photo conductor unit 22 is decided by the configuration which exchanges each photo conductor for coincidence with the photo conductor used most at this time, a photo conductor with little other printing will become useless. At this time, each photo conductor may be considered as a removable configuration from the photo conductor unit 22, and each photo conductor may be exchanged corresponding to printing number of sheets.

[0079] Moreover, in order to perform alignment of each color toner image correctly, each photographic filters 4a, 4b, 4c, and 4d are fixed to the direct case 200. There is also the approach of fixing each photographic filter, using a photographic filter holddown member etc. as other configurations applicable to the image formation equipment of this example, and fixing to the body case 200 the exposure unit which has placed in a fixed position four photographic filters 4a, 4b, 4c, and 4d. Although especially the photographic filters 4a, 4b, 4c, and 4d are not necessarily exchanged as an article of consumption, they are considering as the configuration in which a body's and desorption's are possible, and become possible [adjusting equipment easily].

[0080] Moreover, the erasion lamps 8a, 8b, 8c, and 8d can be arranged in fixed location or the photo conductor unit 22 to a body case.

[0081] In this example, since the life of the middle imprint belt 2 is made the same with a body life, it is considered as the configuration which places in a fixed position the belt firm-bridging rollers 10a, 10b, 10c, and 10d to a case 200. However, a blemish, fracture, etc. may occur in a user's operation mistake etc., and exchange may be needed. For this reason, it is also possible to carry out unitization of the middle imprint belt 2, and to consider as an exchangeable configuration.

[0082] The middle imprint belt cleaner 15 is placed in a fixed position by the body case with the image formation equipment of this example for no exchanging. Of course, the middle imprint belt cleaner 15 can also be made into an exchangeable unit configuration, the middle imprint belt cleaner 15 can be arranged in the middle imprint belt unit described previously, and it can consider as the middle imprint belt 2 and a simultaneous exchange configuration.

[0083] Although the imprint machine 13 becomes dirty by adhesion of a toner, paper powder, etc., when this dirt has big effect on the imprint engine performance, it can also consider the imprint machine 13 as an exchangeable configuration.

[0084] Since the record medium of various classes is ****(ed) while being an elevated temperature, it is difficult for a fixing assembly 19 to maintain the fixing engine performance highly. For this reason, the fixing assembly 19 consists of image formation equipment of this example as an exchangeable unit. Of course, it is also possible to arrange and exchange each for a fixing assembly 19 as another unit again in the case where the oil spreading device 83 (refer to drawing 16) which applies oil, such as silicon, in order to raise the fixing engine performance is used, and the case where the cleaning device 84 which cleans a fixing roller front face is established.

[0085] Furthermore, alignment **** is required for two or more photo conductors 1a, 1b, and 1c and the toner image formed on 1d with a sufficient precision, and it has applied the configuration put with a side plate from the shaft-orientations both ends of each process with the image formation equipment of drawing 1 . Arrangement locations, such as a belt firm-bridging roller which lays the photo conductor unit 22, photographic filters 4a, 4b, 4c, and 4d, and the middle imprint belt 2 by considering as such a configuration, can be correctly positioned with a side plate.

[0086] Therefore, when exchanging each process, it is considering as the configuration desorption of the process is carried out [configuration] to the vertical direction or a longitudinal direction in drawing 5 .

[0087] Top covering which can be opened and closed is prepared, and the photo conductor unit 22 and a fixing assembly 19 release this covering in case 200 top face, and pull out and exchange it for it to the lengthwise direction upper part. Furthermore, covering in which the closing motion for exchanging development counters 5a, 5b, 5c, and 5d is possible is prepared in the right-hand side of the drawing 6 body. Development counters 5a, 5b, 5c, and 5d need to add a load to the photo conductors [1], b [1], and 1c and 1d side in order to have to contact a development roll to a photo conductor. With the image formation equipment of this example, if a developing-machine forcing member is attached in covering opened when exchanging developing machines 5a, 5b, 5c, and 5d and a door is shut to it, the developing machine is made the configuration pushed in by the suitable load.

[0088] The door for removing the record medium which remained in the body is prepared in the left-hand side of the drawing 6 body. Since it is arranged in general perpendicularly and the form of a record medium does not bend [at which the conveyance path of a form does not turn to the degree of pole along the external surface of a body in this example], while it is applicable to a variety of forms, such as pasteboard, removal of a record medium can be performed easily.

[0089] Moreover, the form cassette 16 which supplies a form can be taken out and inserted now from the right-hand side of a body.

[0090] Although one example of drawing 5 shows the configuration which puts each process with a side plate, it is also possible to apply the configuration which prepares opening in a side plate to the delivery

direction of the side plate, for example as used in the field of this configuration, i.e., a record medium, and exchanges each process unit from there. In this case, the photo conductor unit 22, developing machines 5a, 5b, 5c, and 5d, etc. are detached and attached to the shaft orientations of a revolving shaft, respectively.

[0091] Next, the detail configuration of each process is explained.

[0092] The image formation equipment of drawing 1 makes the process rate which is the passing speed of a photo conductor, or a middle imprint belt and a record medium 100 mm/s (100mm/(second)) in order to make the print speed at the time of color printing equivalent to the present monochrome printer, as stated also in advance. If a process rate is made into 100 mm/s, when ****(ing) A4 size form length and horizontally, even if it takes the clearance between forms into consideration, the printing speed of about 16PPM and about 24PPM can be obtained, and a print speed equivalent to the present monochrome printer can be secured, respectively.

[0093] The photo conductors 1a, 1b, 1c, and 1d used with the image formation equipment of drawing 1 are photo conductors of the drum configuration of the diameter of said, respectively, and are considered as the configuration which prepared the organic sensitization layer in the cylinder element tube front face of aluminum. Of course, it is also possible to use an inorganic photo conductor like an amorphous silicon photo conductor as a photo conductor. Important photo conductor surface velocity can be stabilized in the alignment of the toner image formed on each color photo conductor by using photo conductors 1a, 1b, 1c, and 1d as the rigid body of a drum configuration. Furthermore, components cost can be reduced by using the drum of the diameter of said.

[0094] Next, a photo conductors [1a 1b, 1c, and 1d] diameter is explained. The one where the diameter of a photo conductor is possible smaller can miniaturize the whole equipment. However, after being able to irradiate light before decreasing, the to some extent long response time is required for the potential on the front face of a photo conductor. Although the response time changes with the sensibility of a photo conductor, the response time of the organic photo conductor offered by the present condition low price is about 0.1 - 0.2 seconds. For this reason, with the image formation equipment of drawing 1 , since process rates are 100 mm/s, the distance of the exposing point that the light of the photographic filter on a photo conductor hits, and the point that a developing machine develops a photo conductor developing negatives is the need 10mm - about 20mm about an exposing point and the point developing negatives. As a result of examining the diameter of a photo conductor in consideration of arrangement of the process of the electrification machine of the circumference of this speed of response and a photo conductor, a photo conductor cleaner, etc., in the present condition, it turned out that it is required 40mm or more. If a photo conductor is set to 40mm or less, distance between an exposing point and the point developing negatives cannot be secured, and the response of a photo conductor will not fulfill demand. From this result, the diameter of a photo conductor was set to 40mm by this example. Of course, when the sensibility of a photo conductor improves, it is also possible to use a diameter [the about 30mm diameter not more than it], for example, diameter, photo conductor. Moreover, when it is important to perform high-speed printing more, it is also required to enlarge the diameter of a photo conductor.

[0095] Furthermore, it is also possible to use the photo conductor of a belt configuration. When a photo conductor is made into a belt configuration, there are the approach of a belt being pressed down and a problem that a configuration is more complicated than the photo conductor of a drum configuration, but since the arrangement tolerance of each process of the circumference of a photo conductor increases while being able to make the arrangement tooth space of a photo conductor small by the firm-bridging approach of a belt, a circumference of photo conductor nearby miniaturization can be carried out.

[0096] Moreover, the electrification machines 3a, 3b, 3c, and 3d used by this example are charged in the photo conductor 1 using the electrification roller which impressed bias voltage. An electrification roller forms an electrification roller elastic layer on an electrification roller metal shaft, and forms the electrification roller surface layer on it. In order to charge a photo conductor without nonuniformity using an electrification roller, it is necessary to ensure contact to an electrification roller and a photo conductor. For this reason, the electrification roller is contacted by the photo conductor and the suitable load so that the stable nip for which the front face of an electrification roller metal shaft was covered in the electrification roller elastic layer formed of rubber material, such as solid rubber and sponge rubber, can be formed, while constituting. Furthermore, by making the rubber material of an electrification roller elastic layer into conductivity or semi-conductivity, the bias voltage impressed to the electrification roller metal shaft is effectively applied to a photo conductor, and electrification is ensured. In order that the plasticizer contained in the rubber material of an electrification roller elastic layer may prevent deteriorating a toner and a photo conductor in the front face of this electrification roller, electrification roller surface layers, such as a

fluororesin, are prepared in the front face for the purpose, such as reinforcement of the electrification roller 23, and improvement in toner mold releasability.

[0097] The electrification machines [of the image formation equipment of drawing 1 / 3a, 3b, 3c, and 3d] electrification roller prepared the electrification roller elastic layer of urethane sponge rubber with a thickness of 2mm in the electrification roller metal shaft with a diameter of 5mm, and has prepared further the electrification roller surface layer which is the tube of a fluororesin in the front face. For this reason, although the diameter as an electrification roller is very a minor diameter in about 9mm, since sponge rubber is used for the electrification roller elastic layer 25, the contact nature with a photo conductor is good. Tolerance can be given to arrangement of the process of the circumference of a photo conductor by using the electrification roller of such a minor diameter. Moreover, since the resistance of a these electrification roller elastic layer and a surface layer is made low resistance with about 10 komegacm, it can be charged in a photo conductor on a low electrical potential difference. Furthermore, it is also possible to use a corona-electrical-charging machine as other configurations of the electrification machine 3 with the image formation equipment of this example.

[0098] A corona-electrical-charging machine is an electrification machine which arranges a corona wire in the shielding case which prepared opening, impresses the high voltage to a wire, is made to generate corona discharge, irradiates a discharge charge from opening at a photo conductor, and is charged in a photo conductor 1. What prepared the grid which applied specified voltage to opening in order to stabilize the electrification potential of a photo conductor can also be used. With a corona-electrical-charging vessel, since spark discharge will occur and discharge will become unstable if the distance of a wire and a shielding case is narrow, between a wire and shielding cases cannot be narrowed. Therefore, there is an inclination which becomes more large-sized as magnitude of the whole electrification machine than the electrification roller described previously. However, without a corona-electrical-charging machine contacting a photo conductor and directly, it is possible to attain reinforcement of an electrification machine, since it can be charged, and when the reinforcement is more important, a corona-electrical-charging machine can also be used.

[0099] Drawing 6 shows one example of photographic filter 4a of the image formation equipment of this example. The same is said of other photographic filters 4b, 4c, and 4d.

[0100] In office, not only a text document but a photograph has come to be treated by the advance of a computer in recent years. Since it corresponds to this, the image formation equipment of drawing 1 is setting print density (resolution) to 600dpi (dots per inch). In order to make high definition photograph image recording possible in the image formation equipment of an electrophotography method, it is 300dpi at least. It is above required and is 600dpi. The image formation equipment of this example which has print density can respond enough.

[0101] In this example, the laser aligner which consists of semiconductor laser 27, a polygon mirror 28, a polygon motor 29, and an ftheta lens 30 is used.

[0102] The laser photographic filter of drawing 6 carries out reflective scanning of the laser beam of semiconductor laser 27 by the polygon mirror 28, and amends fluctuation of the migration length in the scan layer per the difference of the focal distance by the optical path difference to the photo conductor which is a non-exposing object, and unit angle of rotation of the polygon mirror 28 with the Ftheta lens 30. In order to secure the laser scanning width of face of record image width, the long optical path length is required for from the polygon mirror 28 before a photo conductor. Since the number of pages of the polygon mirror 28 can be increased while the light exposure stabilized in the scanning direction can obtain since there are few amounts of amendments with the Ftheta lens 30 if the scan include angle of the polygon mirror 28 is small-*(ed), high-speed printing is also attained. However, if a scan include angle is small, the distance from the polygon mirror 28 to a photo conductor will be required for a long time, and the dimension of the whole laser photographic filter will become large. In this example, in order to secure about the same printing speed as a monochrome printer, the polygon mirror of the 6th page generally used by the monochrome printer is used.

[0103] In order to carry out stable rotation, as for the polygon motor 29 made to rotate the polygon mirror 28, it is desirable to arrange so that the polygon mirror 28 may be horizontally rotated to the gravity direction. the height of the polygon motor 29 which the height of a photographic filter makes rotate the polygon mirror 28 at this time, and Sayori Taka who added the tooth space of the ftheta lens 30 with which it is more nearly up than a laser scan layer -- it cannot be made small. Since a process rate is 100mm/s with the image formation equipment of drawing 1 , it is 600dpi. In order to obtain print density, the polygon mirror 28 of the 6th page must be carried out about 24000 revolutions in 1 second. The height which the

polygon motor 29 which rotates at the present condition and this rotational frequency needs is about 20mm, and height is required for it about 10mm because of stability reservation of manufacture of the height of the ftheta lens 30. Therefore, as height of the present laser aligner, about 30mm is a limitation. After letting the laser beam reflected by the polygon mirror 28 pass on the ftheta lens 30 like drawing 6, it reflects by the mirror 31 by return, and it is considered as the configuration which exposes photo conductor 1a arranged in the slanting upper part of a laser photographic filter in order to make the height of the whole laser photographic filter min while the laser photographic filter of this example carries out level rotation of the polygon mirror 28.

[0104] Furthermore, exchange of the development counter arranged between each photographic filter with the configuration of drawing 6 since the photographic filter upper part and the lower part are even is also easy.

[0105] The photographic filter of drawing 6 was able to set the height of a photographic filter to about 30mm, as a result of considering as the structure where the height of a photographic filter becomes as small as possible at this appearance.

[0106] As stated also in advance, in order to accelerate printing speed more, when increasing the number of pages of the polygon mirror 28, or to make print width large since it corresponds to a bigger paper size, it is necessary to lengthen the optical path length. At this time, it is necessary to arrange so that the optical path length can take the long clinch mirror 31 inside a laser photographic filter. In order to lengthen the optical path length, drawing 7 makes a photographic filter lower part a convex configuration, and shows the example of the laser photographic filter which has arranged a part of clinch mirror 31. Although the optical path length is securable from the laser photographic filter of drawing 6 for a long time since the photographic filters [4a, 4b, 4c, and 4d] lower part is made into convex structure, the height of a photographic filter is higher than the configuration of drawing 6. In the image formation equipment of drawing 1, when using a laser photographic filter like drawing 7 Arrange the part used as this convex configuration to the photographic filters [4a, 4b, 4c, and 4d] photo conductors [1],b [1], and 1c and 1d side, namely, while arranging the clinch mirror 31 to the photographic filters [4a, 4b, 4c, and 4d] photo conductors [1],b [1], and 1c and 1d side Effective use of the tooth space in equipment is possible by doubling with a photographic filters [4a, 4b, 4c, and 4d] convex configuration a configuration with a developing machines [5a, 5b, 5c, and 5d] of photographic filters [4a, 4b, 4c, and 4d] arranged up and down, and preparing irregularity. Although the magnitude of the whole equipment becomes large a little by this By changing a developing machines [5a, 5b, 5c and 5d] appearance, namely, enlarging a developing machine Since photographic filters [4a, 4b, 4c, and 4d] heights are prepared in the photo conductors [1],b [1], and 1c and 1d side while being able to make development counters 5a, 5b, and 5c and the toner storing capacity in 5d increase, exchange of development counters 5a, 5b, 5c, and 5d is easy like the case of drawing 5.

[0107] Moreover, in order to make magnitude of the whole equipment small, it is effective to make the height of a photographic filter small. Photographic filters [4a, 4b, 4c, and 4d] height is decided by the height of the tooth space which secures the height of the polygon motor 29, and the magnitude of the ftheta lens 30. The polygon motor 29 needs to prepare devices, such as a bearing, in shaft orientations in order to carry out stable rotation, and thin-shape-izing is [among these] difficult for it. The example of drawing 8 shows the configuration which arranges this polygon mirror 28 and the polygon motor 29 to the method of the body inside, namely, formed the polygon mirror 28 and the polygon motor 29 in the exterior of the part by which a laminating is carried out to development counter 5a (b, c, d) shown by the dotted line. With this configuration, in the part by which a laminating is carried out to a development counter 5, since only the mirror 31 which reflects the ftheta lens 30 and a laser beam in photographic filter 4a (b, c, d) is arranged, height can be made small. Although it is necessary to devise the structure of the ftheta lens 30 in order to constitute such optical system, it is effective in the miniaturization of equipment. Moreover, it is also possible to use the ftheta lens 30 and ftheta mirror which has ftheta property instead of a mirror 31 by return.

[0108] To form an image using two or more different laser aligners and form the last image for it in piles, it is required to abolish distortion and deformation of a polygon mirror, ftheta lens, and a clinch mirror as much as possible. However, since such an optic will become high sharply if precision is raised, actually, distortion, deformation, etc. of each part article will have the error of a configuration, and distortion which is different in the image exposed with each photographic filter, respectively will occur. For this reason, with the image formation equipment of this example, he constitutes four photographic filters combining components with the beforehand same distortion and deformation, and is trying to include in a body. By

performing combination of such components, distortion of the image of each photographic filter becomes the same, and can press down a gap of an image. When performing combination of such components, the devices in which the location of an optic is adjusted, such as a device in which the location of ftheta lens is adjusted, may be established. Furthermore, the following is also available as other examples of a photographic filter.

[0109] Drawing 9 is one example which applied LED array 32 to the photographic filters 4a, 4b, 4c, and 4d of the image formation equipment of this example. Since the photographic filter of an LED array puts the printing dot of image width, and LED of the same number in order and exposes a photo conductor, a long optical path like the laser aligner described previously is unnecessary, and can make a photographic filter small. Furthermore, in order to make LED corresponding to each dot emit light independently, improvement in the speed is easy. The LED array photographic filter consists of lenses 34 which carry out image formation of the light which emitted light from LED array 32 required on a straight line by which number arrangement was carried out, and the driver circuit 33 which drives them and LED array 32 on a photo conductor. 600dpi It is 600 (230-240 [i.e.,] per cm) per inch, and since print width required to **** A4 perpendicularly is required for the number of LED required in order to expose with print density 21cm or more, when ****(ing) about 5400-6000 pieces and A4 horizontally, since print width is required 30cm or more, it is 7000-9000 pieces. These LED arrays 32 and driver circuits 33 are created using a semi-conductor process.

[0110] Since it is necessary to drive a lot of LED independently in an LED array photographic filter, respectively, it becomes [wiring etc.] complicated and is not practical to establish a driver circuit in the photographic filter exterior. For this reason, with the image formation equipment of this example, a driver circuit 33 is also formed on the same chip in which LED array 32 was formed, and the interface with the exterior is considered as the easy configuration. It is also possible to prepare the circuit which amends dispersion in the luminescence brightness of each LED, and the circuit which enables a gradation output on this chip, in order to equalize the luminescence brightness of each LED. These LED arrays 32 and driver circuit 33 grade were chip-ized per hundreds - thousands of pieces from a viewpoint of mass-production nature and the improvement in the yield, and have secured print width by combining some dozens of - chips. If it differs for every LED array photographic filter to which the shade of an image will arise between each chip, and alignment will expose each photo conductor if the alignment during each LED chip is not exact at this time, the toner image of each color cannot be set correctly. For this reason, it is necessary to make alignment during each chip into 1 or less (600dpi 42 micrometers or less) dot.

[0111] In this example, the lens 34 is arranged in order to carry out image formation of the light in which LED emitted light on a photo conductor 1, and the rod-lens array is used for it.

[0112] Drawing 10 is drawing which set the LED array photographic filter to photographic filter 4a, and has been arranged to photo conductor 1a. other photographic filters and a photo conductor -- the same .

[0113] With the image formation equipment of this example, since the process of the circumference of photo conductor 1a concentrated on the lower part part and arranges from the core of photo conductor 1a, if a photographic filter 4a body is separated from a photo conductor and arranged, arrangement tolerance of each process of the circumference of a photo conductor can be enlarged. In order to make this possible, it is effective to lengthen the lens length of an LED array photographic filter, for example, to set it to about 10-30mm with the image formation equipment of drawing 1 or to lengthen the focal distance of a lens, for example, to set it to 10-50mm with the image formation equipment of drawing 1 .

[0114] It is like a configuration of forming the clinch mirror 31 and exposing a photo conductor, using the lens of a long focus as other examples of a photographic filter. With this configuration, since the LED array photographic filter is arranged in the location distant from photo conductor 1a, tolerance can be given to process arrangement of the circumference of a photo conductor.

[0115] Drawing 11 shows a developing machines [which were applied to this example / 5a, 5b, 5c, and 5d] sectional view.

[0116] Developing-machine 5a (5b, 5c, 5d) consists of the development section 35 which develops the latent image of a photo conductor 1a (b [1], c [1], 1d) front face, and the toner storing section 36 which stores a toner. As for the development section 35, the engine performance falls with printing, and since a toner is consumed, the toner storing section 36 still also needs to be exchanged according to printing number of sheets. In this example, while reducing the frequency of article-of-consumption exchange by really exchanging the development section 35 and the toner storing section 36 for coincidence as a configuration, the production cost is reduced.

[0117] Furthermore, in developing-machine 5a of this example, by arranging horizontally the development

section 35 and the toner storing section 36, the height of developing-machine 5a is made small, and the whole equipment is miniaturized.

[0118] The nonmagnetic 1 component contact development method is used for the development section 35 of developing-machine 5a of this example. A nonmagnetic 1 component development method rubs the toner which adhered on the developing roller 37 using the member of a blade configuration, and it is charged in the amount of electrifications of a convention of a toner while it forms a toner thin layer. Furthermore, by contacting photo conductor 1a directly and making this toner thin layer adhere to it, it is the method which develops the electrostatic latent image on photo conductor 1a, and is the method which does not use a carrier.

[0119] Thus, since electrification of a toner and rationalization of thickness are performed using simple members, such as a developing roller 37 and a blade, while an electrostatic latent image is developed by Sharp and high-definition record is possible for it, in order to contact directly the toner thin layer formed in developing-roller 37 front face to photo conductor 1a and to develop it, a price can be reduced with the miniaturization of the development section 35.

[0120] the development section 35 -- a developing roller 37, the toner regulation blade 38, the reset roller 39, and the toner adhesion blade 40 -- it rakes out and constitutes from a paddle 41 and a toner delivery paddle 42.

[0121] The developing roller 37 is carrying out surface roughening of the development roll 37 front face by suitable granularity, in order to carry out stable conveyance of the toner, while using the roller which covered the surroundings of a metal shaft with elastic bodies, such as rubber, in order to make photo conductor 1a of a drum configuration contact certainly with the rigid body. In order to develop the toner of developing-roller 37 front face on photo conductor 1a, bias voltage is impressed to a developing roller 37. The developing roller 37 is rotating the peripheral speed of a developing roller 37 at a rate quicker than photo conductor surface velocity while a developing roller 37 rotates upwards from a lower part in the location which rotates the front face in the surface migration direction and this surface direction of a photo conductor and which counters with a photo conductor in this example, in order to fully supply a toner to a photo conductor 1a front face. While electrifying a toner, the toner regulation blade 38 which forms the toner thin layer of convention thickness in developing-roller 37 front face is arranged in developing-roller 37 lower part. Although the contact pressure of the toner regulation blade 38 is important for electrification and layer pressure regulation of a toner, in order to make this into stability and homogeneity, they use metaled sheet metal with the image formation equipment of this example. Furthermore, the toner regulation blade 38 is contacting the toner regulation blade 38 at the counter to the hand of cut of a developing roller 37 so that a toner may not pile up in the contact section of the toner regulation blade 38 and a developing roller 37 with rotation of a developing roller 37. At this time, the flat-surface section of the toner regulation blade 38 is contacted, without contacting toner regulation blade 38 tip to the direct developing roller 37 so that there may be past [no / scraping] about the toner adhering to a developing-roller front face. Make a new toner adhere to developing-roller 37 front face, it is made to rotate in the same direction as a developing roller 37, and the reset roller 39 performs scraping and supply to coincidence while removing once the toner which remained without developing developing-roller 37 front face. In this example, in order to ensure scraping of a toner, and adhesion at contact to a developing roller 37, and a list, the roller which covered the front face of a metal shaft by sponge is used. The toner adhesion blade 40 is formed so that the toner made to adhere to a developing roller 37 with the reset roller 39 may not fall from developing-roller 37 front face by gravity. It rakes out, and the toner with which a paddle 41 failed to be scratched with the toner regulation blade 38 piles up near a blade, it has prepared in order to condense and to make it not fix, and it rotates counterclockwise, and the toner which failed to be scratched with the toner regulation blade 38 is discharged in the toner storing section 36 direction.

[0122] The toner delivery paddle 42 is formed in order that even the reset roller 39 may supply the toner in the toner storing room 36. The reset roller 39 needs to convey a toner even to the reset roller 39 against gravity, in order to supply a toner to this part, since it arranges in the upper part of the development section. The toner delivery paddle 42 runs through its toner of the toner storing interior of a room in the reset roller 39 section, and supplies it to the reset roller 39. When running one's toner delivery paddle 42 through one's toner on the reset roller 39, toner **** raising actuation is ensured by synchronizing both rotation so that the toner delivery paddle 42 may be contacted in the toner ***** paddle 41.

[0123] The toner storing section 36 consists of a toner storing room 43 and a toner supply paddle 44, as shown in drawing 11 .

[0124] The toner storing room 43 is a part which stores the toner determined by printing number of sheets.

One or more toner supply paddles 44 are arranged in the toner storing room 43, rotate, and supply a toner to the development section 35.

[0125] In the developing machines 5a, 5b, 5c, and 5d of drawing 11 applied to the image formation equipment of drawing 1, since the development section and the toner storing section 36 have been arranged horizontally as mentioned above, developing machines [5a, 5b, 5c, and 5d] height h is about 40mm.

[0126] Although developing-machine 5a of drawing 11 makes integral construction the development section 35 and the toner storing section 36, when reinforcement of the development section 35 can be performed, it is also possible to constitute another member, the development section 35, and the toner storing section 36 for these as a toner hopper 45. Although it will leave a development counter to a body and only the toner hopper 45 will be exchanged at this time, since the toner hopper 45 can arrange the image formation equipment of drawing 1 in the location near the external surface of a body from developing-machine 5a, exchange is easy.

[0127] One example of a developing machine with disengageable such development section 35 and toner hopper 45 is shown in drawing 12. In order that the development method called 2 component development method may be used for developing-machine 5a of drawing 12, it may consist of the development section 35 and a toner hopper 45 and may make the height of developing-machine 5a low, it arranges these horizontally like drawing 11. 2 component development method is a method which conveys and develops the developer which made the toner adhere to a carrier on a photo conductor front face using magnetism etc. while it mixes with a toner the carrier which is magnetic powder and electrifies a toner.

[0128] The development section 35 of drawing 12 consists of the magnet roller 46 in a development roll, the developer regulation blade 47, a developer delivery paddle 48, a stirring paddle 49, and a toner concentration sensor 50.

[0129] A magnet roller 46 is what formed the roller which gave magnetism in the interior of a sleeve, forms the magnetic brush by the developer near the photo conductor, and develops the electrostatic latent image on a photo conductor while it conveys a developer by rotating a sleeve. The developer delivery paddle 47 is formed in order to supply a developer to a magnet roller 46. The developer regulation blade 48 is formed in order to make suitable the amount of the developer adhering to magnet roller 46 front face, and it has regulated the excessive developer using the member of a blade configuration. The stirring paddle is formed in order to stabilize image quality by making it often mix, while stirring the toner and carrier in 49 developers and electrifying a toner. The toner concentration sensor 50 is formed in order to measure the amount of the toner contained in development existence, it measures the bulk density of a developer using a magnetism sensor, and detects toner concentration.

[0130] The toner hopper 45 consists of a toner storing room 43, a toner supply paddle 44, and a toner feed roller 51. The toner storing room 43 is a part which stores the toner of the amount decided by printing number of sheets like the example of drawing 11. The toner supply paddle 44 is formed in order to send a toner to a toner feed roller. The toner feed roller 51 is formed in order to supply a toner to the development section 35.

[0131] The developing machine of drawing 12 is developed with the magnetic brush which consists the developer stirred with the stirring paddle 49 of a toner formed in the front face, and a carrier while delivery and a magnet roller 46 convey this on magnet roller 46 front face with the developer delivery paddle 48. And again, a developer flows back to the stirring paddle 49, and is stirred.

[0132] Furthermore, it is charged, while a toner will be sent to the development section 35 from the toner hopper 45 and mixing with a carrier with the stirring paddle 49, if the toner concentration sensor 50 detects the fall of the toner concentration in a developer.

[0133] Since the sensor which measures the device in which a toner and a carrier are made to stir compared with a nonmagnetic 1 component development method, and the concentration of a toner is required for 2 component development method, it has the fault that a development counter is enlarged and complicated, but since it performs development of the toner to a photo conductor with the magnetic brush magnetically formed in a magnet roller front face, its contact load of a photo conductor and a development counter is small, and it can make low running torque of a photo conductor and a development counter. For this reason, it is also possible to be easy to stabilize rotation of an important photo conductor in the alignment of each color toner image, and to use the development counter of drawing 12 from a viewpoint of the alignment of an image.

[0134] Thus, when the image formation equipment of drawing 1 sets about 30mm and development counters [5a 5b, 5c, and 5d] height to about 40mm for photographic filters [4a 4b, 4c, and 4d] height, spacing of each photo conductor is set to 70-75mm. Since the height which piled up these processes by four colors is

about 280-300mm, even if the height of the body which applied the height for the top-face panel of a body, such as a form cassette, etc. to this is large, it is about 500mm. This is height accepted satisfactory in office. [0135] Next, the configuration of the middle imprint belt 2 used with the image formation equipment of this example is explained using drawing 1.

[0136] The middle imprint object belt 2 of this example laid the middle imprint belt 2 with the belt firm-bridging rollers 10a, 10b, 10c, and 10d which are four rollers, and arranges the imprint auxiliary rollers 9a, 9b, 9c, and 9d which contact photo conductors 1a, 1b, 1c, and 1d and the middle imprint belt 2 to the space of the middle imprint belt 2 interior.

[0137] The belt firm-bridging rollers 10a and 10b are laying the middle imprint belt 2 for a long time perpendicularly, in order to secure the field which arranges the photo conductors 1a, 1b, 1c, and 1d of each color.

[0138] Belt firm-bridging roller 10c is arranged in the field of the opposite side of the photo conductor array side of the middle imprint belt 2. The imprint machine 13 is arranged in the outside of this belt firm-bridging roller 10c, and the imprint to the record medium of the toner image formed in middle imprint belt 2 front face is performed. Belt firm-bridging roller 10d, although arranged to the belt firm-bridging roller 10d upper part, it arranges so that unlike other belt firm-bridging rollers 10a, 10b, and 10c it may prepare in the outside of the middle imprint belt 2 and the middle imprint belt 2 may be stuffed into the interior from an outside. Thus, while securing the arrangement tooth space of the fixing assembly 19 arranged to the imprint machine 13 upper part by arranging belt firm-bridging roller 10d, and the middle imprint belt cleaner 15, the cross section of the middle imprint belt 2 is made small, and packaging density of equipment can be made high.

[0139] Furthermore, these belt firm-bridging rollers 10c and 10d are installing in the location which can arrange the imprint machine 13 and a fixing assembly 19 so that a form conveyance path important for form conveyance may serve as a smooth curve, and they have measured correspondence of a variety of [pasteboard to an envelope] forms, and reduction of a jam.

[0140] Thus, since the middle imprint belt 2 is laid, the perimeter of a belt is about 200-350mm. Moreover, in order that a peculiarity may attach the diameter of a belt firm-bridging roller to a belt with the curvature of a belt firm-bridging roller as it is a minor diameter, it is set to about 40mm. It is possible to make velocity turbulence by the photo conductor and the eccentricity of a belt firm-bridging roller into the same period by furthermore making a photo conductor and a belt firm-bridging roller into the same diameter, and location ***** of each color image can also be made easy.

[0141] In this example, in order to imprint and pile up the toner image formed with each photo conductors 1a, 1b, 1c, and 1d on the middle imprint belt 2, it is required to run stability the middle imprint belt 2, i.e., to make the velocity turbulence and approach of a belt small. Since especially the approach of a belt is accompanied by destruction of a belt, it is necessary to make it always lay so that it may be important also from a viewpoint of dependability reservation of equipment to press this down and a belt may not come together with the belt firm-bridging rollers 10a, 10b, 10c, and 10d.

[0142] With the image formation equipment of this example, by using as a driving shaft belt firm-bridging roller 10b arranged down-stream from 1d of photo conductors, it is driving so that the belt side in contact with photo conductors 1a, 1b, 1c, and 1d may always be pulled. By this, it is hard coming to generate the slack of the belt side in contact with photo conductors 1a, 1b, 1c, and 1d, and alignment of each color toner image can be performed easily. Furthermore, in order to imprint good, it is considering as the configuration which carries out elastic support of a driving shaft and the belt firm-bridging roller 10d by which process components, such as photo conductors 1a, 1b, 1c, and 1d and the imprint machine 13, are not arranged directly in an opposite location, and gives tension to a belt.

[0143] It is important to the dependability of equipment, and high-definition-izing to press down the approach of the belt of the middle imprint belt 2. By dispersion in the parallelism of the member in contact with the middle imprint belt 2, the approach of a belt is generated, when a belt receives the force of a hand of cut and the direction of a right angle. Since it is difficult with the present machining technique to arrange these members in parallel, the approach of a belt is generated. With the image formation equipment of this example, in order to prevent the excessive approach of a belt, the belt approach prevention cap of a taper configuration is prepared in the edge of belt firm-bridging roller 10a arranged [the belt edge] to the rib and middle imprint belt 2 interior. If a belt begins to come together in response to the force of a hand of cut and the direction of a right angle, from a belt firm-bridging roller end section belt, the rib of a belt will contact the taper part of a prevention cap, and will stop approach. The thickness which can fully stop approach of a belt, such as resin and rubber material, and the quality of the material with which reinforcement was filled are used for a rib.

[0144] Similarly, the belt approach prevention member of a back taper configuration is prepared in the belt firm-bridging roller 10a exterior as other configurations which press down the approach of a belt. With this configuration, if approach occurs to the middle imprint belt 2, a belt edge will run aground to a belt approach prevention member, and will regulate belt approach.

[0145] Furthermore, in order to press down the excessive approach of a belt certainly, it is also possible to establish the device which amends belt approach positively. When a belt comes together, drawing 13 weakens the tension of the belt of the direction which came together, and is the side elevation (a) of the belt approach amendment device in which the force which is going to move to hard flow at a belt is generated, and drawing having shown the elevation (b). This configuration constitutes the edge of belt firm-bridging roller 10a from taper piece 56 with a pivotable taper configuration, tells the turning effort which this taper piece 56 receives to tension roller 10d of a belt, and it links it so that a tension may be weakened. If a belt comes together and the rib 53 of a belt contacts the taper piece 56, the taper piece 56 will receive turning effort by friction with a rib 53. If turning effort is received, the taper piece 56 will pull the belt firm-bridging roller supporter material 57 by the turning-effort transfer shaft 58, as shown in drawing, and will reduce the tension of the belt tension spring 59 in the side which the belt approached. For this reason, the imbalance of shaft orientations can occur in the tension of a belt, the force in which a belt visits hard flow can be received, and belt approach can be returned.

[0146] When the quality of the material like the rubber quality of the material expanded and contracted greatly is chosen as the middle imprint belt 2 as main structure, it becomes impossible to perform alignment of each color image correctly. For this reason, while having elasticity required as a belt as belt material to be used, elongation needs to consider as a small configuration. For this reason, although the belt member of a resin metallurgy group is used, it is also possible to constitute a belt combining these quality of the materials. For example, the configuration which piled up resin, the configuration and rubber which piled up the metal, a metal, and resin can be used. The resin conveyor belt with a thickness of 0.1-0.2mm is used for this example with polycarbonate resin.

[0147] As cross-section structure of the middle imprint belt 2, it is possible to apply two or more layer structure of the monolayer structure of only a belt base material, a belt base material, a belt surface layer and a belt base material, a belt flesh-side surface layer and a belt base material, a belt surface layer, and a belt flesh-side surface layer etc. The middle imprint belt of this example is the monolayer structure which used for the belt base material the resin ingredient described previously. However, in order to prevent a belt deteriorating from ozone, heat, etc. in order that a front face may carry out wear prevention, in order to make suitable adhesion of the toner adhering to a front face, the belt surface layer formed by thin layers, such as a fluororesin, may also be prepared. Moreover, in order to strengthen reinforcement of a belt more, it is also possible to use the belt flesh-side surface layer formed by the belt material of a thin metal. Furthermore, the imprint of a toner is greatly influenced by the front-face nature of the middle imprint belt 2. Since a toner adheres to the middle imprint belt 2 mechanically and chemically and generates image defects, such as decline in imprint effectiveness, and an inside omission of an alphabetic character thin line, when the toner mold-release characteristic of middle imprint belt 2 front face is bad, middle imprint belt 2 front face requires that a toner should not adhere easily. For this reason, it is also good to prepare coat layers, such as a fluororesin, in a belt front face, or to make low-molecular ingredients, such as very small powder, such as a silica, and a wax, adhere to the front face of the middle imprint belt 2 as *****.

[0148] There is the approach of connecting film material and making it into a belt configuration as a general process of a belt member. The belt material created by such process has a joint inevitably. A contact load is generated with the level difference of a joint in the part in contact with the middle imprint belts 2, such as a photo conductor 1, the imprint machine 13, and the middle imprint belt cleaner 15, and the joint of the middle imprint belt 2 causes belt velocity turbulence. Moreover, it is necessary to make it a joint not enter in a printing area. For this reason, with the image formation equipment of this example, belt material without a joint is used as a middle imprint belt. It can also be used by making it not imprint the image which established the device in which the location of a joint was detected and was formed with the photo conductor 1 in the joint section while such a belt that has a joint crushes by heat or the pressure, or the level difference of a joint part is ground and it makes it small.

[0149] Next, the electrical property of the middle imprint belt 2 is explained.

[0150] Since the imprint to a record medium from the middle imprint belt 2 is the particle to which the toner was charged, it uses electrostatic force for the imprint to the middle imprint belt 2 from photo conductors 1a, 1b, 1c, and 1d, and a list. The imprint of a toner gives the charge of a toner, like-pole nature, or reversed polarity to photo conductors 1a, 1b, 1c, and 1d, the middle imprint belt 2, and the imprint machine 13, and

the electric field generated with this charge perform it. For this reason, the middle imprint belt 2 needs to have the effective electrical characteristics which can generate stability for such imprint electric field. The electrical property of the middle imprint belt 2 of this example is semi-conductivity. Although a charge is given to the middle imprint belt 2 in the case of an imprint, it remains to the middle imprint belt 2, and an imprint is made unstable or the charge given in each imprint section as the middle imprint belt 2 is high resistance causes image defects, such as discharge nonuniformity.

[0151] In the contact section of photo conductors 1a, 1b, 1c, and 1d and the middle imprint belt 2, the imprint of the toner from the photo conductor 1 to the middle imprint belt 2 is performed by impressing bias voltage to the imprint auxiliary rollers 9a, 9b, 9c, and 9d of middle imprint belt 2 rear face. Although a charge is given to middle imprint belt 2 rear face from the imprint auxiliary rollers 9a, 9b, 9c, and 9d at this time, the middle imprint belt 2 also rides and moves this given charge onto a belt in order to move with advance of a process. When the middle imprint belt 2 begins to separate from photo conductors 1a, 1b, 1c, and 1d, the capacity of the opening between photo conductors 1a, 1b, 1c, and 1d and the middle imprint belt 2 becomes small rapidly, the potential of a middle imprint belt rises, discharge occurs, and it is generating **** about electrification nonuniformity to the toner on the middle imprint belt 2. In order to stop this, it is required to make the charge on the middle imprint belt 2 leak, namely, to make the resistance of a middle imprint belt low with the rise of potential. The capacity of an opening is $100\text{p} - 0.1\text{pF/cm}^2$, and in order to attenuate the potential which has joined this capacity earlier than a process rate, it needs to set up smaller than a process rate the time constant which are the resistance of the direction of a field of the middle imprint belt 2, and the product of this capacity. In order that the middle imprint belt 2 may move 1cm in 0.1 seconds, resistance must make less than [$1\text{G}-10\text{Tohm}$] the image formation equipment of drawing 1 whose process rates are 100 mm/s so that a time constant may become less than [this]. At this example, width of face of 1cm sufficiently smaller than this and the resistance per die length of 1cm are 0.1Gohm about resistance of belt material. It adjusts and uses so that it may become.

[0152] By the way, in order to stabilize the potential of the middle imprint belt 2, the configuration which prepares the member of low resistance in middle imprint belt 2 rear face is also applicable. The middle imprint belt 2 is made two-layer [of a resistive layer and a conductive layer], or it can realize by making small surface electrical resistance of middle imprint belt 2 rear face, and this configuration becomes possible [making middle imprint belt 2 rear face into same electric potential] over the middle imprint belt 2 perimeter. In this configuration, the charge given to middle imprint belt 2 front face in the imprint section as it is high resistance of a resistive layer remains, and in order to accumulate, it is necessary to prepare a semi-conductive resistive layer like what was explained previously. While the middle imprint belt 2 is moving each imprint section, it is necessary to choose resistance, in order not to make a charge remain on middle imprint belt 2 front face so that a charge may decline. What is necessary is for the surface velocity of the middle imprint belt 2 to be 100 mm/s, and just to use the time amount and the quality of the material for hundreds of or less ms concerning the time constant which are the resistance of middle imprint belt 2 resistive layer and the product of capacity moving each part with the image formation equipment of this example, since the distance between each imprint section and the toner electrification machine 11 is several cm. Although the configuration of the middle imprint belt 2 becomes complicated with this configuration, since the potential of each part becomes stable, there is an advantage that control of an imprint of each part becomes easy.

[0153] Moreover, even if it makes low resistance middle imprint belt 2 the very thing, the middle imprint belt 2 whole can be made into same electric potential over the perimeter. In this case, an imprint can be stabilized, although it is necessary to increase capacity of a power source since the current which flows in each imprint section increases.

[0154] The thing of high resistance of the resistance of the quality of the material used for the middle imprint belt 2 is also usable by preparing the electrification control-section material which controls electrification of middle imprint belt 2 front face. The scorotron electrification machine and corotron electrification machine which added AC and DC are used for such electrification control-section material, the charge specified on middle imprint belt 2 front face is given, and electrification of a belt is controlled.

[0155] In order to imprint photo conductors 1a, 1b, and 1c and the toner on 1d to the middle imprint belt 2, it is required to give a toner and the charge of reversed polarity to the middle imprint belt 2 side, or to give a toner and the charge of like-pole nature to the photo conductors [1], b [1], and 1c and 1d side.

Furthermore, in order to ensure an imprint, it is important to stick certainly photo conductors 1a, 1b, 1c, and 1d and the middle imprint belt 2. With the image formation equipment of this example, the imprint auxiliary rollers 9a, 9b, 9c, and 9d of roller geometry are arranged at the middle imprint belt 2 rear face, and while

impressing bias voltage to this, the middle imprint belt 2 is pushed and stuck to photo conductors 1a, 1b, 1c, and 1d. The imprint auxiliary rollers 9a, 9b, 9c, and 9d are elastic rollers which covered the metal shaft by sponge, and the force is applied so that the middle imprint belt 2 may be pushed against photo conductors 1a, 1b, 1c, and 1d by the suitable pressure.

[0156] The configuration of the imprint section which imprints photo conductors 1a, 1b, and 1c and the toner on 1d to the middle imprint belt 2 can also apply configurations other than the above.

[0157] When the corona-electrical-charging machine has been arranged at the middle imprint belt 2 rear face, a charge required for an imprint is supplied to middle imprint belt 2 rear face with a corona-electrical-charging vessel, and the middle imprint belt 2 is further stuck to photo conductors 1a, 1b, 1c, and 1d using the belt forcing member of a blade configuration. When it has arranged so that the imprint auxiliary rollers 9a, 9b, 9c, and 9d may be stuffed into a photo conductor side between each photo conductors [1a, 1b, 1c, and 1d] imprint locations, the charge required for an imprint is given to the belt rear face with these imprint auxiliary rollers 9a, 9b, 9c, and 9d.

[0158] In this example, since photo conductors 1a, 1b, 1c, and 1d always touch the middle imprint belt 2, in case a monochrome image is printed, the photo conductor which prints a color without the need also touches the middle imprint belt 2. When the need has only such a photo conductor of the one section to printing, it is possible to prolong the life of a photo conductor by Lycium chinense without separating from a middle imprint belt the photo conductor which is not used and making it print. For this reason, the device to which disjunction of the middle imprint belt is carried out from a photo conductor may be established.

[0159] Next, other examples of the middle imprint belt cleaner of this invention are explained to drawing 14 (a) and (b).

[0160] This middle imprint belt cleaner 15 is formed in order to clean the transfer residual toner on the middle imprint belt 2, and the cleaning-blade method which scratches a toner mechanically using an elastic body blade is used for it as well as the photo conductor cleaner 6. With the image formation equipment of this example, as shown in drawing 1, a cleaning blade is arranged to belt firm-bridging roller 10a located in the topmost part of the middle imprint belt 2, and the toner on the middle imprint belt 2 is cleaned.

Furthermore, it is directly under [which is established in belt firm-bridging roller 10a] a cleaning blade, and the same cleaning blade is prepared also in belt firm-bridging roller 10d arranged on the front face of the middle imprint belt 2. Since a toner may contact directly, as for belt firm-bridging roller 10d arranged on middle imprint belt 2 front face, it is desirable to prepare such a cleaning member. The belt ** toner stripping section 52 which collects ** toners is arranged in the this belt firm-bridging roller 10d flank lower part. The toner scratched by the cleaning blade arranged at belt firm-bridging roller 10a falls on belt firm-bridging roller 10d, and carries out uptake by the cleaning blade which cleans belt firm-bridging roller 10d.

[0161] Furthermore, it is shown in drawing 14 (a) as other examples. This configuration prepares a cleaning blade in belt firm-bridging roller 10a, and arranges the belt ** toner stripping section 52 to the tooth space formed of belt firm-bridging roller 10d which is pushing in the middle imprint belt 2 from the outside. In this configuration, the toner which failed to be scratched by the cleaning blade shifts to the belt ** toner stripping section 52 by gravity. Since it arranges with the image formation equipment of this example so that it may push into the interior of a belt while forming some belt firm-bridging rollers in the front face of the middle imprint belt 2, it is easy to secure the tooth space which arranges a middle imprint belt cleaner to this appearance.

[0162] The brush roller method which cleans a toner mechanically and electrically as other methods using the brush roll which gave potential can be used. To a cleaning-blade method, it needs a power source while its device is complicated, but since the contact load with a middle imprint belt is small while it is effective, a brush roller method has the advantage that a belt can be driven with low torque, by the case where cleaning is carried out from the upper part of the middle imprint belt 2, in order not to choose the direction to clean. The configuration of drawing 14 (b) shows the configuration which cleans to the belt firm-bridging roller 10d coincidence which the brush cleaner 65 is contacted to the middle imprint belt 2 and belt firm-bridging roller 10d both, and contacts the middle imprint belt 2 and a photo conductor front face. The toner cleaned with the brush cleaner 65 shifts to the recovery roller 66, and fails to be scratched with the recovery blade 67. The toner which failed to be scratched falls to the belt ** toner stripping section 52, and are collected to it. In addition, contact arrangement of the brush roller 65 can be carried out like drawing 14 (b) at the middle imprint belt 2 and belt firm-bridging roller 10d both, and the approach of moving and collecting the toners which prepared and cleaned the cleaning blade to belt firm-bridging roller 10d to belt firm-bridging roller 10d etc. can be applied to the image formation equipment of this example.

[0163] Electrification nonuniformity may produce the toner on the middle imprint belt 2 by contact on photo

conductors 1a, 1b, and 1c and 1d front face, and electrification nonuniformity serves as a difference of imprint effectiveness, and generates image nonuniformity. In order to make electrification of the toner on the middle imprint belt 2 into homogeneity, the toner electrification machine 11 is formed in the image formation equipment of this example. The toner electrification machine 11 is a scorotron electrification machine constituted by establishing a shielding case so that a wire may be surrounded, and preparing a grid between a wire and the middle imprint belt 2, and controls the electrification potential of middle imprint belt 2 front face with the potential of a grid.

[0164] In order to use the toner electrification machine 12 effectively at this time, the conductive member set as convention potential may be arranged at the rear face of the middle imprint belt 2 with which the toner electrification machine 12 counters.

[0165] Moreover, in this example, in order to imprint the toner image on the middle imprint belt 2 to a record medium, the imprint machine 13 is formed.

[0166] Since the toner image on the middle imprint belt 2 is a color, the thickness of the toner in each part of the inside of 1 image differs. In order to imprint these images in a form completely certainly, it is required to stick a toner and a form. For this reason, in this example, while sticking a record medium to a toner using the imprint machine 13 of roller geometry, bias voltage is applied and the toner is imprinted. The roller which covered the front face of a metal shaft in the elastic layer formed by the rubber material of the shape of a solid or sponge is used for the imprint machine 13 in order to stick a record medium to a toner certainly. An electrical potential difference required in order to imprint a toner from the middle imprint belt 2 to a record medium is impressed to a metal shaft, and in order to use effectively the electrostatic force which imprints a toner, the semi-conductive or conductive thing is used for the elastic layer. The imprint machine 13 is considered as the configuration forced on the middle imprint belt 2 by suitable load in order to push a record medium against the middle imprint belt 2 certainly.

[0167] Like this example, when the middle imprint belt 2 and the imprint machine 13 are being contacted, the fogging toner on the middle imprint belt 2 etc. may adhere to the imprint machine 13 at the time of non-****. Since the toner adhering to the imprint machine 13 adheres to a record-medium rear face and serves as dirt, it is the purpose which prevents this and can also establish the device in which the imprint machine 13 is made to shunt the middle imprint belt 2. When [, such as the time of ****,] it is required to contact the imprint machine 13 to the middle imprint belt 2, the dirt of the imprint machine 13 can be made [except] into the minimum by separating the imprint machine 13 from the middle imprint belt 2. The device in which the imprint machine 13 is cleaned, and the device in which reverse transcription of the toner which applied the suitable bias voltage of a toner and like-pole nature to the imprint machine 13, and adhered on the imprint machine 13 is carried out to a middle imprint object are established, and the dirt of the imprint machine 13 by such toner can also be removed positively.

[0168] If a form and a toner can be stuck using the form presser part material of a blade configuration etc. as other configurations furthermore used for the imprint machine of the image formation equipment of this example, a corona-transfer machine can also be used.

[0169] Moreover, to the color picture formation equipment of this example, the form electric discharge machine 14 (refer to drawing 1) is arranged at the form conveyance direction downstream of the imprint machine 13.

[0170] Since some charges poured in at the time of an imprint remain, the record medium after a toner imprint sticks to the middle imprint belt 2 by electrostatic force. In this example, since belt firm-bridging roller 10c of a minor diameter is arranged in the opposite location of the imprint machine 13, it is possible to remove a record medium with the curvature of belt firm-bridging roller 10c and form rigidity. However, neither thin paper with small rigidity nor the OHP sheet of high resistance with which an imprint charge tends to remain may be unable to exfoliate in stability. To the image formation equipment of this example, in order to make exfoliation of a record medium easy, the form electric discharge machine 14 which discharges the imprint charge which remained is arranged. The form electric discharge machine 14 of this example is an electric discharge machine from which the needlelike microelectrode which gave regular potential is put in order and arranged along with the imprint machine 13, discharge is generated between the potential on the rear face of a record medium, and microelectrode, and the charge on the rear face of a record medium is removed.

[0171] Furthermore, by improvement in the speed of printing speed etc., when electric discharge of a form needs to be ensured, AC electric discharge method using AC corona discharge can also be used as another method of the form electric discharge machine 14.

[0172] In addition, when form conveyance after an imprint also needs to be carried out to stability, the belt

imprint machine having the imprint of a toner and the function of both form exfoliation conveyances is also available to the image formation equipment of this method instead of the above-mentioned imprint machine 13 and the form electric discharge machine 14.

[0173] Furthermore, in order to make exfoliation of a record medium good, the approach of carrying out surface roughening of the middle imprint belt 2 front face is also applicable. If surface roughening of the middle imprint belt 2 front face is carried out, since an opening will be made between a record medium and a form and adsorption power will become weaker, exfoliation of a form becomes very easy. On the other hand, if surface roughening of the middle imprint belt 2 is carried out, it will become easy to generate image defects, such as a white omission of an image, but this approach is effective, when electrification of a toner etc. can be improved and deterioration of image quality can be prevented.

[0174] Next, one example of the fixing assembly 19 of the image formation equipment of this invention is explained.

[0175] In the image formation equipment of this invention, the engine performance which can respond to that a fixing assembly secures the color enhancement of a color picture and a list enough at a high-speed print speed is required.

[0176] For this reason, a fixing assembly needs to be able to supply a heating value required to dissolve a toner with a sufficient response. Furthermore, like this invention, since the heat which a fixing assembly emits in small image formation equipment tends to affect other processes, being established at as low temperature as possible is desirable.

[0177] In this example, the toner is established using a fixing belt. Or it arranges a fixing belt for a long time in accordance with a form conveyance path, the section and heating time which are established in the two or more photo conductors [1a, 1b, 1c, and 1d] array direction in a toner by arranging in the same direction in general are securable for a long time. Since the record medium to which the toner has adhered can fully be heated by this, a toner can be established certainly. Moreover, since a response does not need to supply excessive heat early, either, in order to perform heat conduction using a thin member called a fixing belt, fixing of a toner is comparatively possible at low temperature.

[0178] Furthermore, since it is considering as the configuration laid [firmly] across a part for the die length to which each photo conductor 1 arranged the middle imprint belt 2, and length for a long time while arranging horizontally each photo conductor 1a, the middle imprint belt 2, and a fixing assembly 19 side by side as shown in drawing 1 , a fixing assembly long in the direction of a conveyance path of a form can be arranged, without enlarging equipment. For this reason, it is satisfactory to use the fixing assembly constituted by the member of the above belt configurations in any way.

[0179] The detail configuration of this fixing assembly 19 is shown in drawing 15 .

[0180] The fixing assembly 19 of this example consists of the fixing belt 74 of a belt configuration, the fixing belt firm-bridging rollers 75a and 75b which lay it, a heater 76 and the adhesion roller 77 made to stick a form to a fixing belt, an exfoliation roller 78 that tears off a form, and a tension roller 79 which gives tension to a fixing belt.

[0181] As for the fixing belt 74, what combined heat-resistant resin, a heat-resistant rubber metallurgy group belt, or them is available. In this example, the belt with which the mold-release characteristic of a toner carried out the coat of the nickel belt of a thermally conductive high metal by silicone rubber with a good thickness of 20-40 micrometers is used. This fixing belt 74 is laid with three rollers. The fixing belt firm-bridging rollers 75a and 75b are metaled rollers, and arrange the adhesion roller 77 and the exfoliation roller 78 in the opposite location, respectively. A tension roller 79 gives a tension to a fixing belt, and is being fixed by means of a spring. The heaters 76, such as a nichrome wire heater, are arranged inside at fixing belt firm-bridging roller 75a. It is made to make the heat of the fixing belt 74 easy for the adhesion roller 77 to be a metal roller which has an elastic layer on a front face, to arrange it so that it may push against fixing belt firm-bridging roller 75a, to stick a record medium to the fixing belt 74, and to tell a toner. The exfoliation roller 78 arranged in the opposite location of belt firm-bridging roller 75b is formed in order to prevent that give shearing force to the toner fused while removing a record medium, and a toner sticks to the fixing belt 74. The exfoliation roller 78 also uses for the front face the metal roller which has an elastic layer like the adhesion roller 77.

[0182] The heat generated in a fixing assembly 19 provides the heat insulation member 80 in the interior side of a body at the fixing assembly 19 of this example so that the interior of a body may not be affected.

[0183] In the fixing assembly of drawing 15 , if it takes into consideration from the arrangement configuration of other process components, spacing between the adhesion roller 77 and the exfoliation roller 78 can be set to 40-100mm. For this reason, in process rate 100 mm/s, 0.4 - 1-second reservation of the time

amount which heats the toner on a record medium is possible. Since the roller fixing assembly established using two rollers can secure nip width of face only about several [at most] mm, considering that heating time is 0.02 - 0.06 seconds, a toner can fully be heated.

[0184] When fixing can carry out easily using the toner of a low-melt point point etc., or when the fixing engine performance is securable by use the approach of make it correspond to the class of record medium, and reduce a fixing rate, it is also possible to use the fixing assembly of the roller fixing method which is make to pass a record medium and is establish in a toner between two rollers heated to regular temperature.

[0185] The configuration of the roller fixing assembly which are other examples of the fixing assembly of this invention is shown in drawing 16.

[0186] In this configuration, the toner on a record medium is established by heat and the pressure with the roller of the pair of the heating roller 81 which has a source of heating in the interior, and a backup roller 82. A heating roller 81 and a backup roller 82 are rollers which covered the front face with elastic bodies, such as silicone rubber and a fluororubber. Surface layers, such as a fluororesin, may be prepared in a roller front face in order to raise a mold-release characteristic with a toner. Furthermore, the mold-release characteristic of toner and heating roller 81 front face is raised by forming the oil spreading device 83 which applies a silicone oil etc. in the front face of a heating roller 81.

[0187] In addition, at the time of fixing, the toner and paper powder of a minute amount may adhere to a fixing member. These toners and paper powder may be accumulated in a roller front face, and may become the factor which reduces the life of a roller. For this reason, the cleaning roller 84 which cleans these roll member front faces is formed in the heating roller 81 and the backup roller 82 in order to remove this minute amount toner and paper powder.

[0188] Of course, the above oil spreading devices and a cleaning device are applicable also to the example of drawing 15.

[0189] Moreover, the form heating component 85 which heats a form as shown in drawing 17 may be formed in the form conveyance direction upstream section of a fixing assembly 19. An infrared heater and a tabular heater are used and the form heating component 85 heats a record medium by contact and non-contact. By forming such a form heating component 85, it is also possible to enable it to be easily established by heating a form beforehand.

[0190] Next, the form cassette of this invention and one example of the periphery are explained using drawing 1. The form cassette 16 of this example is for storing a form, can be arranged at the bottom of a body and can store hundreds of sheets of forms. In order to use the feed device 17 certainly, the device which pushes a record medium against a feed device from a lower part is required, but by this example, the spring is built in the form cassette 16, and if the form cassette 16 equips in a body, the device which pushes up a record medium up is used. When setting up many number of sheets of the record medium put into the form cassette 16, it is also possible to establish the device in which a record medium is made to go up and down in the source of power from a body.

[0191] Like the publication to drawing 21 as a configuration at the time of extending the form cassette 16, the laminating of the extension cassette 103 is carried out to a body lower part, it is arranged, and extension is made possible, without changing a crawler bearing area. Moreover, it is possible to the extension cassette 103 to also store the form of various sizes and various kinds of forms, and it can respond to it in each example mentioned above, respectively.

[0192] Feeding of the form which is a record medium concretely is explained.

[0193] The feed device 17 which feeds paper to the record medium from the form cassette 16 is the configuration equipped with the pick roller 86 and the separation putt 87 at least. The pick roller 86 is a roller which prepared members, such as rubber with high coefficient of friction with a record medium, in the front face, and contact arrangement has been carried out at the record medium, and it pulls out a record medium from a cassette by rotation. The separation putt 87 is friction material, such as rubber and a cork, it was contacted on pick roller 86 front face, is arranged, and divides only into one sheet the record medium which the pick roller 86 pulled out.

[0194] Moreover, since it is necessary to contact the pick roller 86 to a record-medium tip and separation putt 87 both, pick roller 86 path cannot be made small. For this reason, in order to arrange the pick roller 86 between the form cassette 16 and a body mark copy process, it is necessary to secure a tooth space. On an equipment configuration, when this tooth space needs to be made small, it is also possible to apply the following feed devices.

[0195] Next, it explains below as one example of the feed device of this invention.

[0196] First, the part which carries out the pick of the record medium, and the part to separate are divided,

and the pick roller 86, a delivery roller, and a retard roller are formed, respectively. A detailed explanation pulls out the record medium in a cassette from the form cassette 16 with the pick roller 86. At this time, the record medium by which a pick is carried out also has the case of two or more sheets. In order to separate the record medium of two or more sheets at this time, the delivery roller and retard roller which have been arranged up and down through a record medium are formed, the delivery roller arranged up rotates in the pick roller 86 and this direction, and he is trying to make hard flow rotate the retard roller arranged caudad by the torque limiter. When two or more record media have been sent, a downward retard roller carries out inverse rotation, and it works so that an excessive record medium may be pushed back to the form cassette 16 side. When a record medium stuffs one sheet or all extraneous articles into a cassette side, a torque limiter works by the frictional force of a record medium and the delivery roller arranged in the upper part, and a form is conveyed to the resist roller 18 side. By this method, since the pick roller 86, a delivery roller, and a retard roller can be arranged on a straight line and the roller of a minor diameter can be used, respectively, the arrangement tooth space of the feed device 17 can be made small.

[0197] Moreover, other examples of the feed device 17 are explained.

[0198] The separation putt 87 is arranged at a level with the form cassette 16, and the member which pulls out a record medium from the form cassette 16 is used as the pick belt of a belt configuration. In order that a pick belt may give rubber material with high coefficient of friction, or reinforcement, what covered the hard-rubber hair side of belt side with rubber with high coefficient of friction is used. Although the approach of feeding is as having mentioned above, since it can use the object of a minor diameter for the pick belt firm-bridging roller which lays a pick belt, it can make small the arrangement tooth space of the feed device 17.

[0199] Moreover, the resist roller 18 of this example is formed in order to double timing with the toner image on the middle imprint belt 2 and to send a form to the imprint section, and is used combining the elastic roller which covered the metal shaft with the rubber for acquiring sufficient conveyance force of the metal roller and record medium for raising rotational-speed precision etc. while it arranges the tip of a form. A form sensor is also put side by side, if a form reaches the resist roller 18 section, the pick roller 86 will be suspended on the resist roller 18, and the location of an image and a form is doubled with it by driving the resist roller 18 to the timing which suits the image tip on the middle imprint belt 2.

[0200] Next, impression of the bias voltage to each process component of the image formation equipment of this invention is explained using drawing 18.

[0201] In order to develop and imprint a toner, it is necessary to impress bias to developing machines 5a, 5b, 5c, and 5d or the imprint machine 13. The direction of the bias at the time of an imprint is decided by setup of the polarity of a toner, a development method, and the zero potential section at the time of development.

[0202] One example of the bias voltage impression which showed what kind of potential is given to each part is shown in drawing 18.

[0203] In this example, the organic photo conductor and the minus electrification toner were used for the sensitive material of a photo conductor, and the reversal development method in which development with high resolution is more possible is adopted.

[0204] Therefore, since the electrification machines 3a, 3b, 3c, and 3d are charged in minus potential in photo conductors 1a, 1b, 1c, and 1d, minus bias is added also like [minus bias] developing machines 5a, 5b, 5c, and 5d. Since an electrification machine is an electrification roller, the bias impressed to the electrification machines 3a, 3b, 3c, and 3d at this time may superimpose alternating voltage in order to stabilize photo conductor potential. Although the imprint of the toner from the photo conductors 1a, 1b, 1c, and 1d to the middle imprint belt 2 is performed by making the middle imprint belt 2 side plus or it makes a photo conductor side minus In this example, from photo conductors 1a, 1b, and 1c and the member from which the bias voltage of the electrification machines 3a, 3b, 3c, and 3d, developing machines 5a, 5b, 5c, and 5d, etc. differs in the circumference of 1d being arranged It is considering as the configuration which makes photo conductors 1a, 1b, 1c, and 1d a reference potential, i.e., zero potential, and gives the electrical potential difference of the potential 9a, 9b, and 9c of plus, i.e., imprint auxiliary rollers, and 9d plus to the middle imprint belt 2 side. In case a toner is imprinted in a form from the middle imprint belt 2, the potential of larger plus than the potential currently applied to the middle imprint belt 2 is given to the imprint machine 13.

[0205] In order to make it hard to adhere the toner on the middle imprint belt 2, the minus bias of a toner and like-pole nature is added to belt firm-bridging roller 10d currently stuffed into the middle imprint belt 2. Moreover, since the toner which remained without imprinting with the imprint vessel 13 may be reversed-polarity-ized, it may add plus bias to this belt firm-bridging roller 10d.

[0206] It is also possible to use the configuration which makes zero potential the belt **** rollers 10a, 10b,

10c, and 10d which lay the middle imprint belt 2, and the imprint auxiliary rollers 9a, 9b, 9c, and 9d, adds minus bias to each photo conductors 1a, 1b, 1c, and 1d, and imprints a toner to the middle imprint belt 2 besides the bias configuration shown above.

[0207] Bias voltage impressed to each of these processes is considered as the configuration which a user can adjust for stabilization of image quality, and high-definition-izing. For example, carrying out corresponding to a photo conductors [1a 1b, 1c, and 1d] property as [adjust / photographic filters / 4a 4b, 4c, and 4d / exposure level or the bias voltage of development / a control panel or a switch] can adjust image quality by easy actuation.

[0208] Moreover, it is also effective in stabilization of image quality to develop the above and to control the bias of each part. For example, in case the toner image on the middle imprint belt 2 is imprinted to a record medium, required bias voltage may differ according to the class of record medium, for example, OHP of high resistance and the form which absorbed moisture. Stabilization of the imprint to the class of record medium or change of an environmental condition is realizable by establishing an imprint armature-voltage control device like drawing 19 for this.

[0209] While the imprint armature-voltage control device of drawing 19 impresses bias voltage to the imprint armature-voltage control section 94 which determines the bias voltage of the imprint machine 13 based on the result of the imprint machine current detecting element 93 which detects the current which flows in the imprint vessel 13, and the imprint machine current detecting element 93, and an imprint machine, the output value consists of high voltage power supplies 95 in which adjustable is possible. The current which flows in the imprint vessel 13 is detected, and the imprint always stabilized to the class of record medium or change of an environmental condition by changing imprint bias voltage according to this current value can be realized. Furthermore, it is also possible to detect the coating weight of a toner and to change light exposure and the bias voltage of development and an imprint based on this and to use the approach of detecting the environmental condition which equipment set using temperature, a humidity sensor, etc., and controlling the bias of each process.

[0210] Next, the configuration which established the double-sided printing mechanism which are other examples of the image formation equipment of this invention is explained using drawing 22 - drawing 25.

[0211] When performing double-sided printing, the **** path which turns up a form is required and the following configurations can be applied to the image formation equipment of this example.

[0212] Drawing 22 is the example which applied the configuration which turns up the form which printed the front face in a delivery unit. These double-sided device formed the guide member 105 which shows a delivery unit at the double-sided **** path 106 to the conveyance roller 104 and form in which forward inverse rotation is possible, and arranges the double-sided **** path 106 on the left-hand side external surface of a body further. The form guidance roller 107 which conveys a form in the double-sided **** path 106 is arranged at spacing smaller than the longest form die length to print. The form with which have formed the body resist roller 18 caudad, and the outlet of the double-sided **** path 106 had the double-sided **** path 106 conveyed is constituted so that it may convey in an imprint location again with the resist roller 18. With this configuration, the form printed in the field of a table is operated so that the location of the guide member 105 may be changed for a conveyance roller to an inversion and coincidence to the timing to which the back end of delivery and a form once passed the guide member 105 on the paper output tray of the top face of a body by making a conveyance roller bite a tip and the back end of a form may be sent into the double-sided **** path 106. Then, a form has the double-sided **** path 106 conveyed, and reaches up to resist roller 18 this side. The image printed at the rear face of this form is formed on the middle imprint belt 2, a form is sent into the imprint section with the resist roller 18 to the timing imprinted, and an image is formed in a rear face. It is the description that this approach can constitute the double-sided **** path 106 comparatively small. Moreover, since the double-sided **** device itself does not need a body and complicated connection, there is an advantage that the user itself is able to set. Drawing 23 is the approach of turning up the form which printed the front face on the outside of the left-hand side of equipment, the imprint machine 13, and a fixing assembly 19. These double-sided device formed the guide member 105 which shows a form to the double-sided **** path 106 in the delivery unit, and arranges the double-sided **** path 106 of the S character mold which can turn up a form on the left-hand side external surface of a body further. The body resist roller 18 prepares the outlet of the double-sided **** path 106 caudad, and the form which had the double-sided **** path 106 conveyed is constituted so that it may be again conveyed with the resist roller 18 in an imprint location. With this configuration, the form printed in the field of a table is sent into the double-sided **** path 106 by the guide member 105. Then, a form is conveyed up to resist roller 18 this side by a form's having the double-sided **** path 106

conveyed, conveying it to the location of A, and carrying out inverse rotation of the form guidance roller 107. The image printed at the rear face of this form is formed on the middle imprint belt 2, to the timing imprinted, a form is formed in the imprint section with the resist roller 18, and an image is formed in delivery and a rear face. The form guide before a resist is prepared in order to prevent backward feed [the form sent and reverse-conveyed to the location of A / the double-sided **** path 106]. Since the double-sided **** device itself does not need a body and complicated connection, this approach has the advantage that the user itself is able to set. Moreover, double-sided printing is possible, without a form coming out to the exterior of a body also at once, and a high definition image can be recorded, without a form becoming dirty from feeding to delivery.

[0213] Drawing 24 is the approach of equipment setting caudad the form which printed the front face, and turning it up. These double-sided device formed the guide member 105 which shows a delivery unit to a form at the double-sided **** path 106, and it has formed the double-sided form storing tray 108 in the body lower part while it arranges the double-sided **** path 106 on the left-hand side external surface of a body further. The outlet of the double-sided **** path 106 is established in the double-sided form storing tray 108 of a body lower part, is conveyed by the double-sided form storing tray 108 to hard flow delivery and here, and conveys the form which had the double-sided **** path 106 conveyed to the resist roller 18 section. With this configuration, it shows the double-sided **** path 106 by the guide member 105 to the form printed to the field of a table, and it is stored in the double-sided form storing tray 108 through the double-sided **** path 106. Then, inverse rotation of the form guidance roller 107 is carried out, and a form is conveyed up to resist roller 18 this side. The image printed at the rear face of this form is formed on the middle imprint belt 2, a form is conveyed in the imprint section with the resist roller 18 to the timing imprinted, and an image is formed in a rear face. The form guide at a double-sided tray entry is prepared in order to prevent sending the form conveyed from a double-sided tray to the double-sided **** path 106. Since this approach can store many forms which carry out double-sided printing since the double-sided form storing tray 108 is arranged horizontally, it has the description of being suitable for printing of extensive number of copies. Moreover, since the double-sided **** path 106 is simple, it is hard to produce a jam, and it is easy to maintain.

[0214] Since a double-sided printing path is long and required, while a form is conveyed, a form may shift from the location of normal or may incline. In order to amend these, the device which the specification-part material and specification-part material which regulate a form edge are operated positively, and amends the location of a form may be established.

[0215] As mentioned above, in order to offer small, a high speed, high definition, and high maintenance nature, the image formation equipment of this example formed the middle imprint belt 2 stretched for a long time perpendicularly in the center section of a body, and considered it as the configuration which arranges the imprint machine 13 and a fixing assembly 19 to an opposite field [photo conductor / 1 / of the number of color toners required for one field of the field stretched for a long time, and the same number] perpendicularly. Moreover, the form cassette 16 has been arranged in the body lower part, and the imprint machine 13 and the fixing assembly 19 have been arranged sequentially from [this] a lower part, and while conveying the record medium up, it considered as the imprint and the configuration which performs fixing. Furthermore, while placing in a fixed position two or more photo conductors 1a, 1b, 1c, and 1d in the photo conductor unit 22 Fixing photographic filters 4a, 4b, 4c, and 4d to the body case 200, desorption of the photo conductor unit 22 was carried out in the photo conductors [1a, 1b 1c, and 1d] array direction, and it considered developing machines 5a, 5b, 5c, and 5d as the configuration which carries out desorption to photo conductors [1a, 1b 1c, and 1d] the array direction and a perpendicular direction.

[0216] By this, the image formation equipment of this example is small and a low price, and became the thing excellent in user maintenance nature while it was compatible in high-definition color picture record and high-speed printing.

[0217] Below, other examples of the image formation equipment of this invention are explained.

[0218] One example of the image formation equipment which includes a photographic filter in the photo conductor unit 22 shown in drawing 1 is first explained to drawing 25.

[0219] At the point which the image formation equipment of drawing 25 arranges the photo conductors 1a, 1b, 1c, and 1d of each color side by side perpendicularly, and arranges the middle imprint belt 2 to one photo conductor array side side, although it is the same as the image formation equipment of drawing 1 As opposed to the image formation equipment of drawing 1 accumulating and arranging the developing machines 5a, 5b, 5c, and 5d and photographic filters 4a, 4b, 4c, and 4d of each color to the opposite side of the middle imprint belt of a photo conductor array side It is the description to arrange the photographic

filters 4a, 4b, 4c, and 4d of each color with the image formation equipment of drawing 25 in the photo conductor unit 22 which arranges each color photo conductors 1a, 1b, 1c, and 1d. In order to make the photo conductor unit 22 as small as possible at this time, it is desirable to use a small photographic filter and the LED photographic filter described previously is used in the example of drawing 24. In this example, since the photographic filters 4a, 4b, 4c, and 4d and photo conductors 1a, 1b, 1c, and 1d corresponding to each color are constituted as a unit of one, it is possible the photo conductor of each color and spacing and parallelism of a photographic filter, and to arrange the physical relationship of a photo conductor and a photographic filter with a sufficient precision further, and to hold to stability. For this reason, alignment of each color image can be performed more correctly. Moreover, since it is possible to increase the each developing machines [5a 5b, 5c, and 5d] volume by the tooth space which arranged photographic filters 4a, 4b, 4c, and 4d in the example of drawing 1, a developing machine can be made longer lasting.

[0220] In addition, although magnitude of the periphery length of a photo conductor is not made at least smaller than the sizes (die length etc.) of a record medium, and it is not made to the configuration made small to the tooth-space part lengthwise direction where the photographic filter k is arranged simply since the die length between each photo conductor is limited in design, it is also possible to shorten as much as possible and to make equipment small.

[0221] Furthermore, other examples of the image formation equipment of this invention are explained below.

[0222] In the example of drawing 1, although the electrification machine 3, a photographic filter 4, the developing machine 5, the middle imprint belt 2, the photo conductor cleaner 6, and the erasion lamp 8 arrange to the circumference of a photo conductor 1, it is necessary to arrange these process components from the hand of cut of location sequence and a photo conductor below the line which connects the point developing negatives and the imprinting point of a photo conductor. In order to perform improvement in the speed and highly minute-ization for printing speed more, enlargement of these processes and complication are required. In the example of drawing 26, in order to make large the tooth space of a photo conductor lower part, the configuration which arranges aslant the photo conductor unit 22 which has placed in a fixed position each photo conductors 1a, 1b, 1c, and 1d to the developing-machinesa [5],b [5], and 5c and 5d side is applied. Furthermore, this photo conductor unit 22 pulls out to the slanting upper part which is the orientation of a photo conductor as it is and is exchangeable. Thus, by moving the point of contact of a photo conductor and a middle imprint belt up, while being able to give allowances to the structure of the process arranged in a photo conductor lower part, arrangement tolerance can be made [many].

[0223] Moreover, the middle imprint belt 2 which is next one example of the image formation equipment of this invention is explained about the configuration laid [firmly] across the longitudinal direction for a long time.

[0224] Although having arranged the photo conductor of each color horizontally differ in the example of drawing 27 to the example of drawing 1 arranging the photo conductor side by side perpendicularly, the miniaturization of equipment is realized by arranging a photo conductor to one side of a middle imprint object, and arranging a fixing assembly to the opposite side.

[0225] Moreover, the middle imprint belt 2 horizontally stretched for a long time to the gravity direction by the amount of center section of a body is arranged. The toner of four colors and the photo conductors 1a, 1b, 1c, and 1d of the same number which are used for the field on the middle imprint belt 2 are arranged in a longitudinal direction, i.e., the firm-bridging direction of a middle imprint belt. Around each photo conductor, the **** units 109a, 109b, 109c, and 109d and photographic filters 4a, 4b, 4c, and 4d which perform electrification, development, cleaning, etc., respectively are arranged. Furthermore, around the middle imprint belt 2, the imprint machine 13 and the middle imprint belt cleaner 15 have been arranged, the form conveyance path of ****(ing) a form was prepared in middle imprint belt 2 lower part, and the form cassette 16, the pick roller 86, the resist roller 18, the imprint machine 13, the fixing assembly 19, and the delivery path are arranged in accordance with a conveyance path on a form conveyance path.

[0226] This example of drawing 27 is smaller than what arranges in parallel and arranges a middle imprint object and a fixing assembly by arranging a photo conductor to one side of a middle imprint object, and arranging a fixing assembly to the opposite side. Moreover, in order to enable stable conveyance of a record medium, while arranging the form cassette 16 in a body lower part, arranging the imprint machine 13 and a fixing assembly 19 sequentially from [this] a lower part and conveying a record medium up, it is characterized by performing imprint and fixing.

[0227] Moreover, in the one example of drawing 28, the middle imprint belt 2 horizontally stretched for a long time to the gravity direction by the amount of center section of a body is arranged. 4 color toner used,

the photo conductors 1a, 1b, 1c, and 1d of the same number, and a fixing assembly 19 were horizontally arranged in above the middle imprint belt 2, and are arranged in it. Around a photo conductor and each photo conductor, the **** units 109a, 109b, 109c, and 109d and photographic filters 4a, 4b, 4c, and 4d which perform electrification, development, cleaning, etc., respectively are arranged. The fixing assembly 19 is arranged above belt firm-bridging roller 10e located in the photo conductor arrangement side best style section of the middle imprint belt 2. Furthermore, the imprint machine 13 and the middle imprint belt cleaner 15 are formed in the surroundings of the middle imprint belt 2, the imprint machine 13 is arranged in belt firm-bridging roller 10e located in the photo conductor arrangement side best style section of the middle imprint belt 2, and the location which counters, and the middle imprint belt cleaner 15 is arranged on the top face of the middle imprint belt 2. The form conveyance path which can be conveyed is established with the image formation equipment of this example, without seldom bending a form from middle imprint belt 2 lower part to upper left direction. On the form conveyance path, the form cassette 16, the pick roller 86, the resist roller 18, the imprint machine 13, the fixing assembly 19, and the delivery path are arranged in accordance with the conveyance path.

[0228] Thus, while the form pass which is a form conveyance path serves as a big radii configuration, it is in the location near equipment external surface. For this reason, while various record media, such as pasteboard, and an envelope, a postcard, are ****(ed) and made into stability without a jam from the form cassette 16, removal of the form behind a jam can also be made easy.

[0229]

[Effect of the Invention] As mentioned above, this invention can offer small and a high speed, and the image formation equipment in which high-definition record is possible. Moreover, image formation equipment excellent in maintenance nature, such as article-of-consumption exchange, can be offered.

[Translation done.]

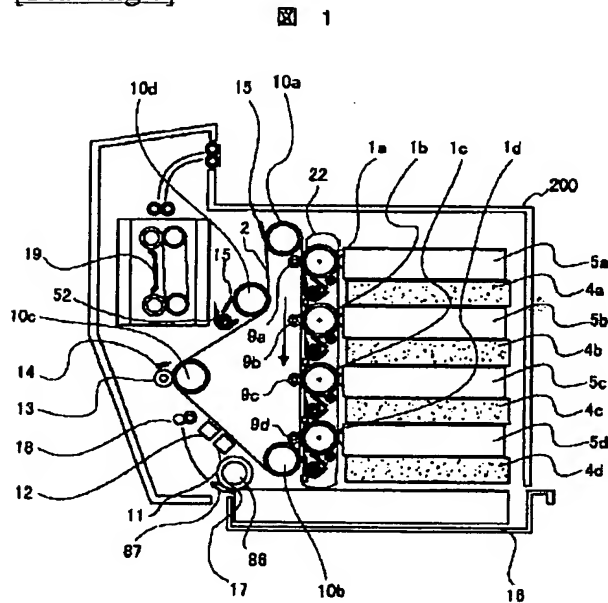
* NOTICES *

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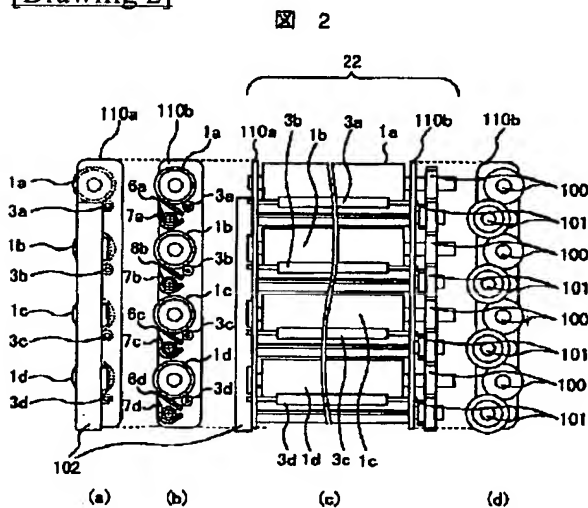
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

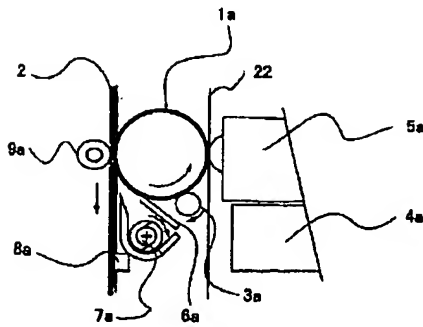


[Drawing 2]

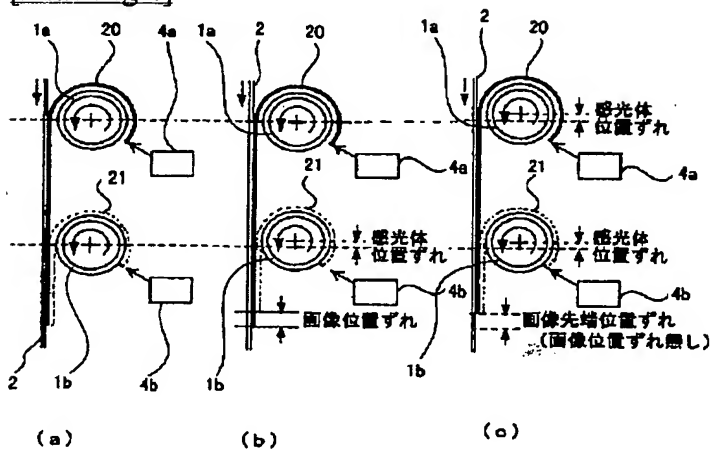


[Drawing 3]

図 3

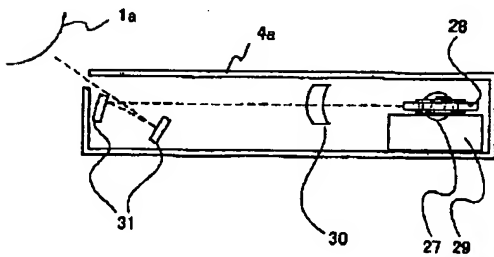


[Drawing 4]



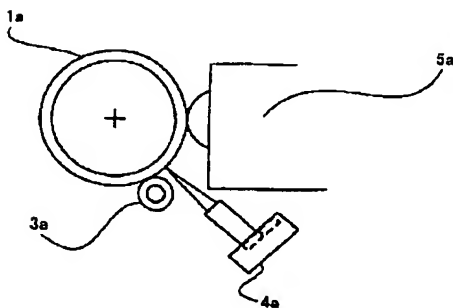
[Drawing 6]

図 6



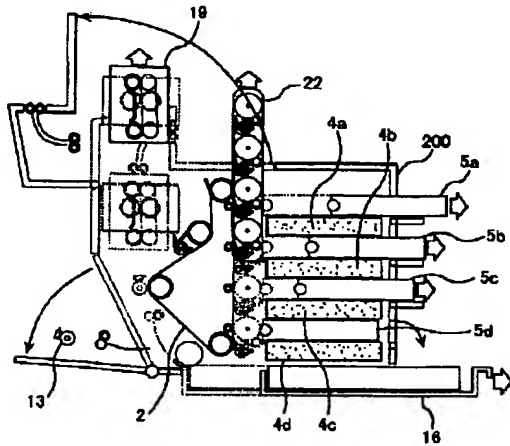
[Drawing 10]

図 10



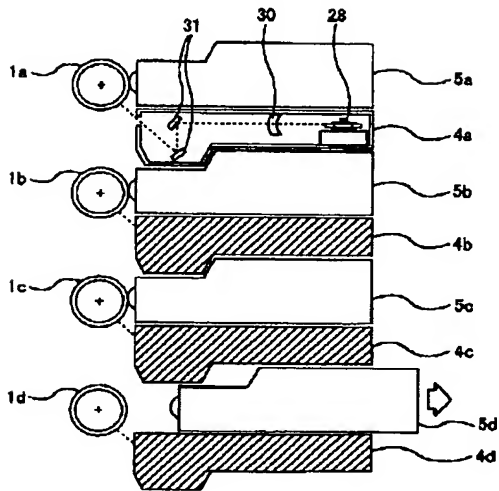
[Drawing 5]

図 5



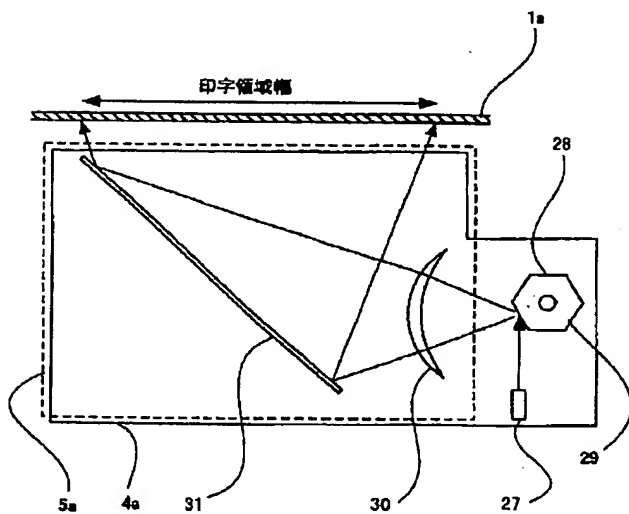
[Drawing 7]

図 7



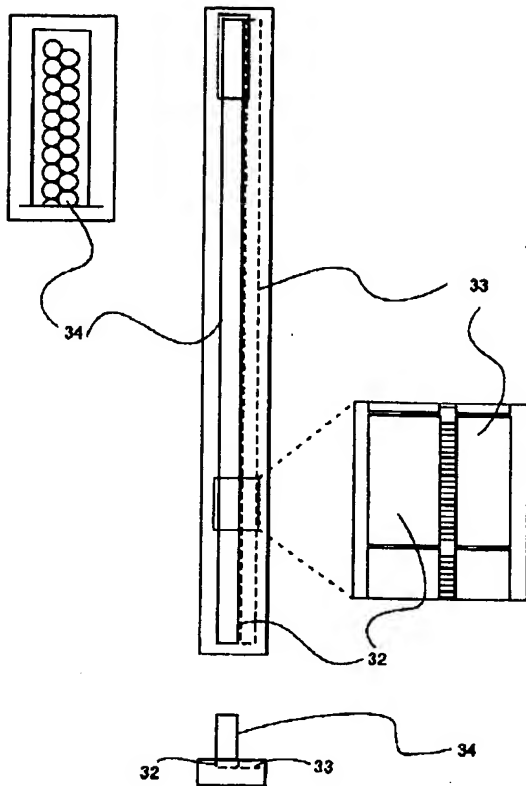
[Drawing 8]

図 8



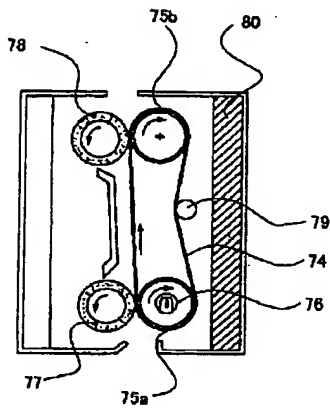
[Drawing 9]

図 9



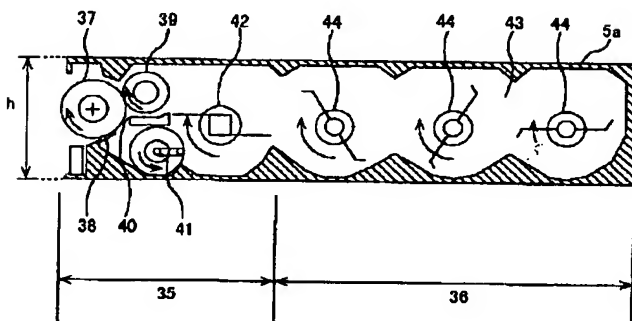
[Drawing 15]

図 15



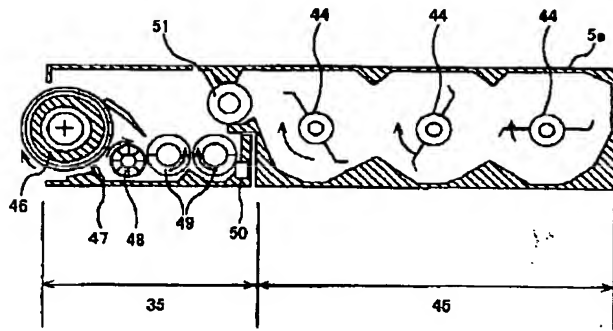
[Drawing 11]

図 11



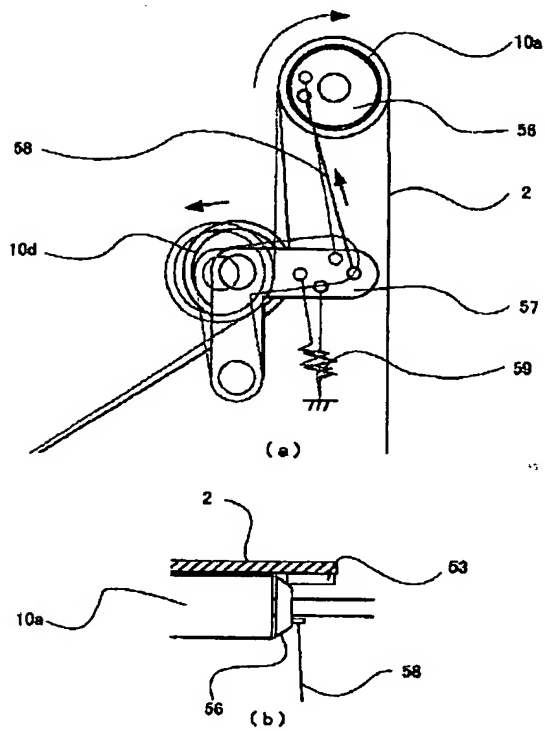
[Drawing 12]

図 12



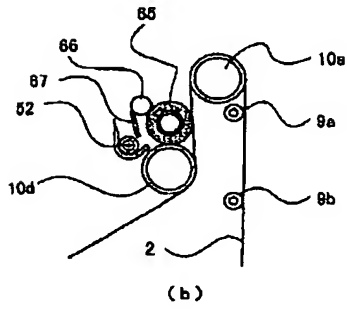
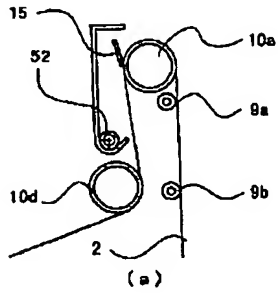
[Drawing 13]

図 13



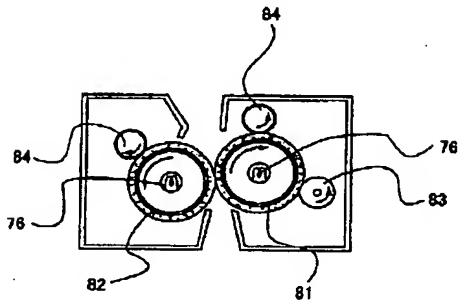
[Drawing 14]

図 14



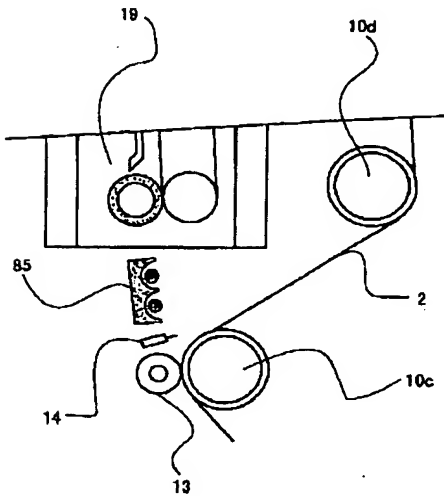
[Drawing 16]

図 16



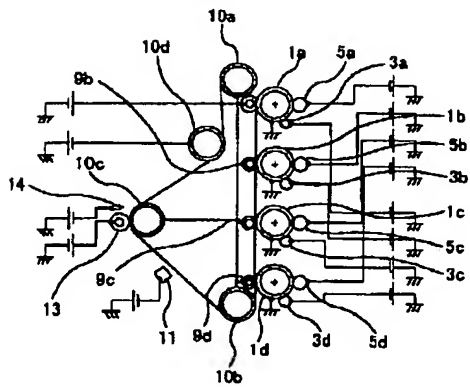
[Drawing 17]

図 17



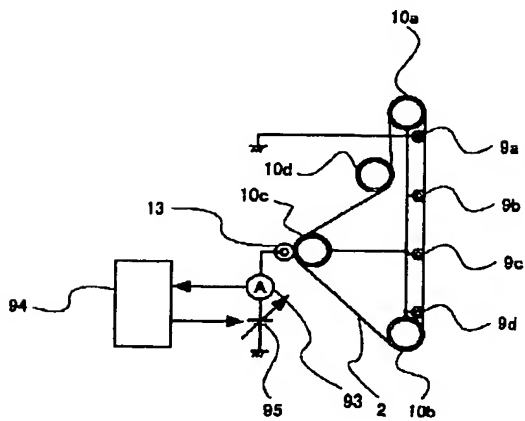
[Drawing 18]

図 18



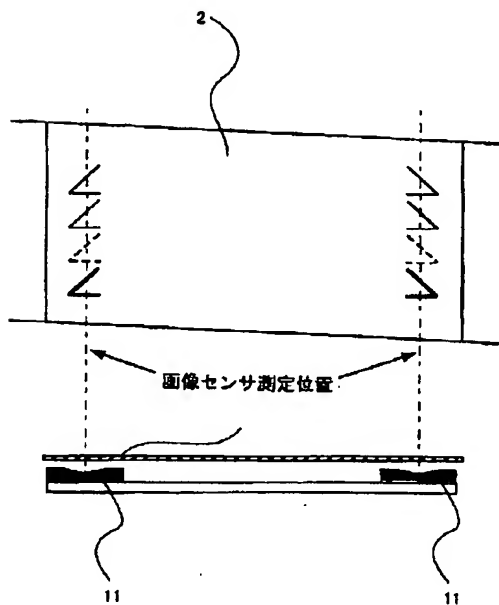
[Drawing 19]

図 19



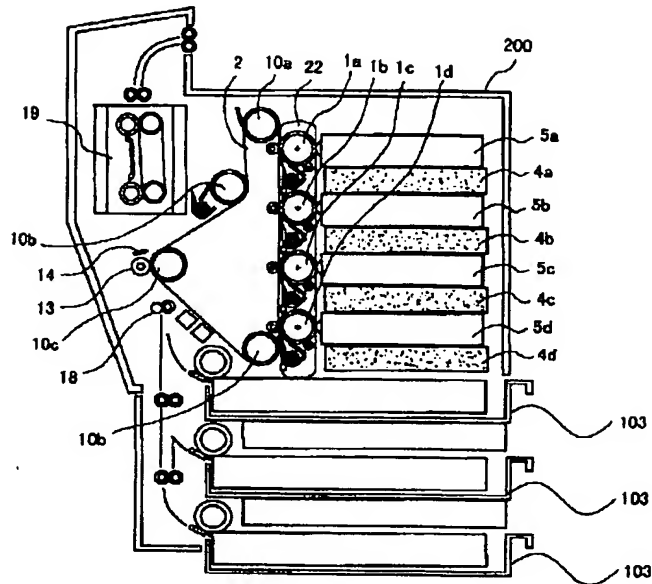
[Drawing 20]

図 20



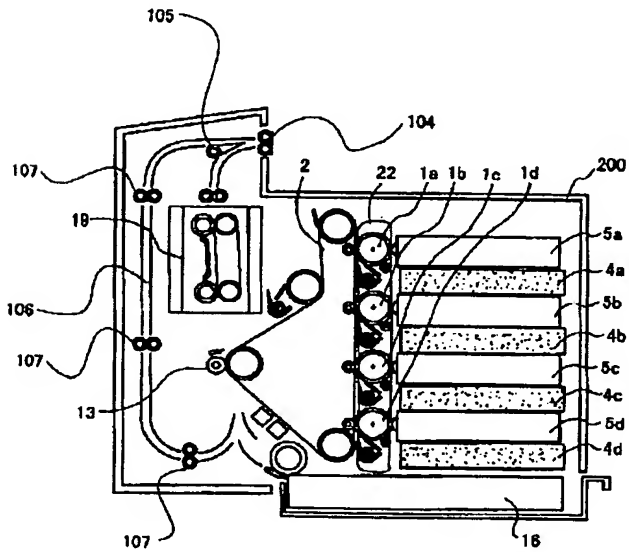
[Drawing 21]

図 21



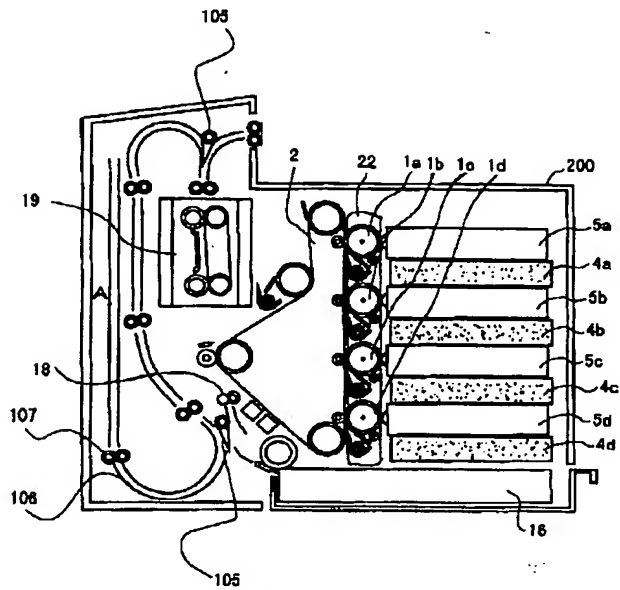
[Drawing 22]

図 22



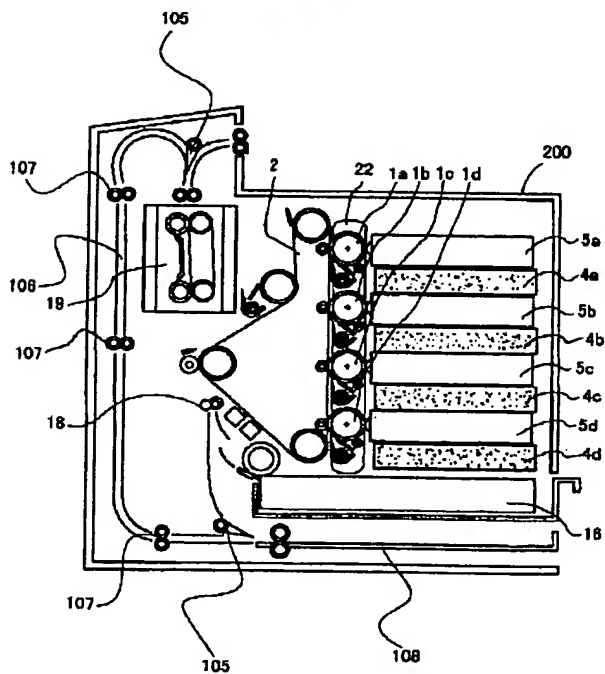
[Drawing 23]

図 23



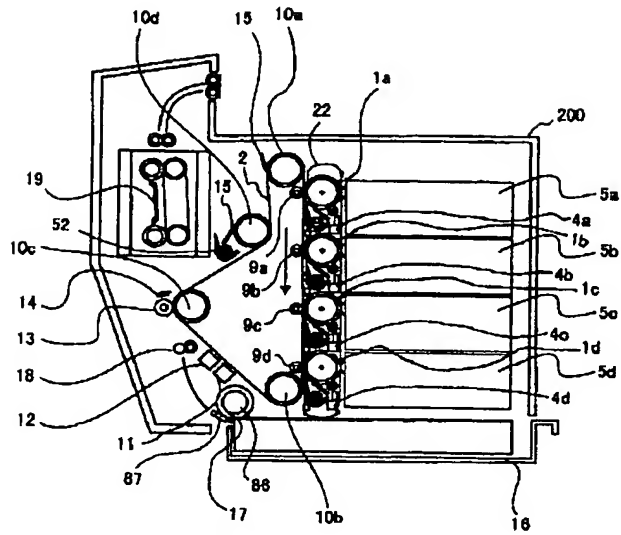
[Drawing 24]

図 24



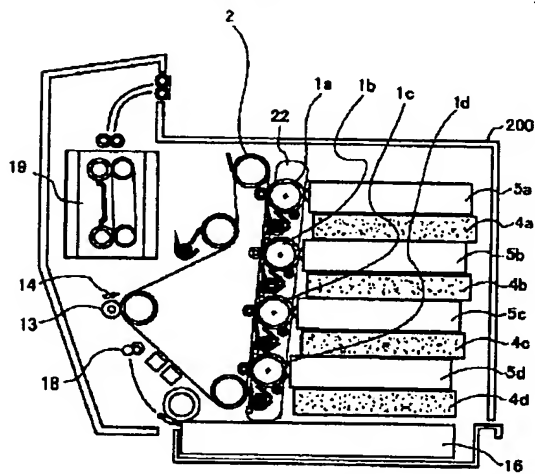
[Drawing 25]

図 25



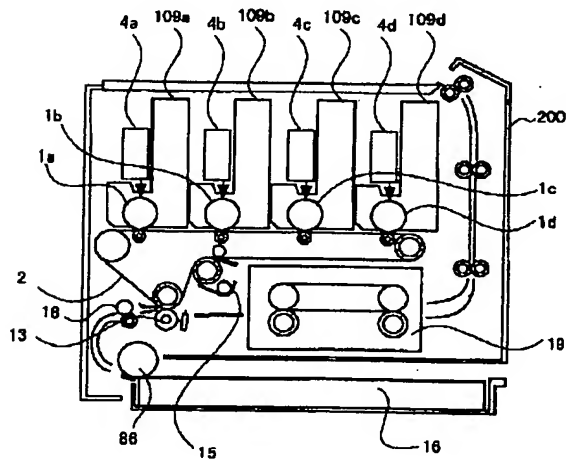
[Drawing 26]

図 26



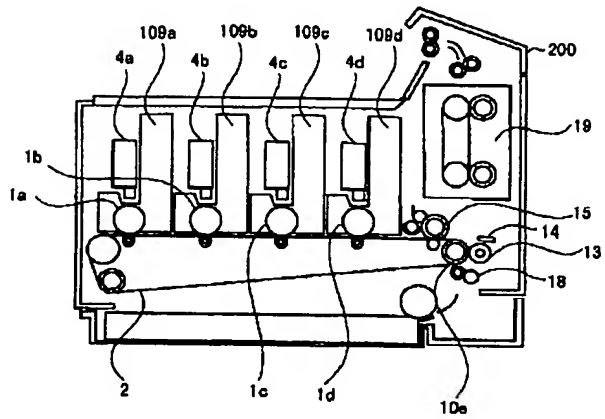
[Drawing 27]

図 27



[Drawing 28]

図 28



[Translation done.]